Oglala Sioux Tribe
Natural Resources Regulatory Agency
Water Resources Department
P.O. Box 320
Pine Ridge, SD 57770
Phone: (605) 867-5624
Fax: (605) 867-2818

Water Resources Department
Reno L. Red Cloud Sr.
ostnrrawrd@gwtc.net

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Chip Kimball
Field Manager
South Dakota Field Office
U.S. Bureau of Land Management
309 Bonanza Street
Belle Fourche, SD 57717

Re: Dewey-Burdock Uranium Mining 'Public Comments' from the Oglala Sioux Tribe, Water Resources Department.

The Oglala Sioux Tribe, Water Resources Department is a subdivision of the Oglala Sioux Tribe Natural Resource Regulatory Agency and an environmental program of the Oglala Sioux Tribe. We are very concerned with the Dewey-Burdock Uranium Mining, affecting and contaminating our groundwater and surface water resources, through the effects of Insitu Leaching uranium Mining from PowerTech Corporation.

More detail is provided in the discussion papers attached below, but major concerns include:

1. Impact on water quality and contamination of both ground water and surface waters.
2. Impact on injection wells
3. Impact storage, interim treatment, shipments, and disposal of radioactive wastes.
4. Impact on tribal treaty rights including hunting and fishing.
5. Impact on historic and Cultural Resources (including rock features).
6. Removal of uranium tailings from past mining operations.
7. Impact on reservation agriculture
8. Impact on air quality

Our Oglala Sioux Tribe Natural Resource Regulatory Agency's commitment to proper stewardship and public service is the framework within our agency to protect, conserve, manage, and preserve the Oglala Sioux Tribe's Natural and Water Resources to meet the needs of present and future generations. We are opposed to Dewey-Burdock Uranium Mining, because of the profound affect it will have on the potential contamination of most voluble resource's our water, land and air.

/s/ Reno L. Red Cloud Sr.
Reno L. Red Cloud Sr.
Oglala Sioux Tribe Water Resources Department Administrator

On July 28, the Bureau of Land Management (BLM) published notice seeking public comments on the 2,775 page Plan of Operations (POO) for the proposed Dewey Burdock In-Situ Leaching (ISL) Uranium Project by Powertech/Azarga in Fall River and Custer counties. This letter provides comments to the BLM from the Oglala Sioux Tribe (OST) on the proposed POO for this project. Contained herein are many reasons why this proposed POO would result in unnecessary or undue degradation of public lands. Therefore, we take a strong position that the BLM should *NOT* approve this POO. Attached and incorporated into this comment for BLM's consideration are an analysis of the National Environmental Policy Act and National Historic Preservation Act (with nine attachments) and an expert report prepared by Dr. Hannan LaGarry.

Our first comment is that this scant 30-day period (until Aug. 26) is ridiculously short for such an important decision. Your agency justified this extremely brief comment period by saying: "Under the Trump Administration's leadership, we've made it a priority to streamline review and approval of uranium and other critical minerals development projects." It can be argued whether uranium is truly a critical mineral or not, but regardless, the problem is that BLM are using this as an excuse to ram an essential public review through a shortened process -- especially now, during the COVID pandemic.

According to the proposed POO, Azarga Uranium Corp., the Canadian owner of the project wants to utilize a process known as ISL to mine about 14.2 million pounds of uranium 'over about 16 years'. However, this controversial project is fraught with all kinds of environmental, technical, legal, and cultural problems. Azarga has been trying to get the necessary permits from all the required agencies for at least a decade. So the question that BLM needs to answer is: "Why the rush now?"

The key issues that must be addressed before this proposed POO can be approved include, but are not limited to those itemized below:

1. ISSUE OF ECONOMIC VIABLILITY

One of the key questions raised by the public during many hearings that occurred in the past was: "Is this proposed ISL uranium mining operation even economically viable?" Unfortunately, it is not answered in any of the POO documents. Many ISL mines in the US are either officially in "standby" mode or are currently not producing. And uranium mining occurred at the Dewey-Burdock site extensively in the 1950s to the 1970s. Is there even enough uranium left to mine here? So before the project goes any further, Azarga should be required to prove that there is actually the amount of ore present that it claims. They should be required to provide this information under close supervision by a knowledgeable regulator selected by the BLM. And it should occur before any POO for this project is approved. If Azarga refuses to answer this question, it should be inferred that they are possibly not committed to the project as designed, that they know there is less uranium present than claimed, that they expect the expenses of this activity actually makes the project unprofitable, or for some other reason. Regardless, BLM should not approve this proposed POO before getting the necessary information about the economic viability of this project.

2. ISSUE OF CONFINEMENT IN THE CLASS III WELL AREAS

Perhaps the most important technical problem with the proposed POO has to do with the confinement of mining fluids in the Class III UIC well areas. This goes to the heart of the safety of the project, and to the heart of this area of the Black Hills. Real doubts exist whether the mining fluids can be contained at the proposed mine site.

One key issue is the number of old boreholes that exist on the site. Dr. Hannan LaGarry reviewed Azarga's borehole logs and reported that at least 7,500 old boreholes exist there. This is contrary to the lower estimated number put forward by Azarga. It is highly unlikely that all old boreholes can be found and properly plugged, especially if the BLM does not confirm this discrepancy is not actively pursuing this step to be required before this proposed POO can be approved.

In addition, research by Boggs and Jenkins of the TVA indicated their 1980 paper "Analysis of Aquifer Tests Conducted at the Proposed Burdock Uranium Mine Site: Burdock, South Dakota," that leakage occurs across the Fuson shale between the Lakota and Fall River formations in the Burdock area. EPA's Class III Fact Sheet notes the connection between the Chilson and Fall River formations in the Dewey area, which was from another TVA test done in the early 1980s. This Chilson member of the Lakota formation was found to be "exceptionally permeable," as quoted by Dr. Perry Rahn (2014. "Permeability of the Inyan Kara Group in the Black Hills Area and its relevance to a proposed in-situ leach uranium mine" in the *Proceedings of the South Dakota Academy of Science*). Dr. Rahn is Professor Emeritus at the South Dakota School of Mines and the acknowledged expert in matters related to hydrology in the southern Black Hills.

This proposed POO is based upon EPA's revised draft Class III UIC permit and one critical issue contained therein is the assumption that the Fuson Shale of the Lakota Formation serves as the confining zone between the Fall River Formation injection interval and the underlying Chilson Sandstone of the Lakota Formation. The EPA states that: "There may be points where the Fusion confining zone has been compromised by improperly plugged exploration drill holes or wells that penetrate the Fusion confining zone. Evidence that suggests at least one breach in the Fusion confining zone is included in the reports on the pump tests conducted by the Tennessee Valley Authority (TVA) and Azarga in the Chilson aquifer in the Burdock area." The draft permit then goes on to specify that Azarga will conduct wellfield delineation drilling during the initial stages of the pump testing phase to "provide more detailed information about the thickness and continuity of the Fusion confining zone" However, breaches are already known to exist, so before the POO can be approved, the BLM should require corrective action to be done BEFORE the Class III area permit is issued, not AFTER.

According to documents referenced in the proposed POO, EPA's revised draft Class III UIC permit also continues to rely heavily on belief that the Morrison Formation is an adequate lower confining layer. However, this is not a fact and one the BLM should seriously challenge because according to the EPA: "The Morrison Formation is intersected by 26 exploration drillholes throughout the Dewey-Burdock Project Area." Again, just like the Fusion situation as noted above, Azarga should be required to verify that breaches do not exist before the POO can be approved. BLM should also disagree with Azarga's assertion that the Unkpapa USDW underlying the Morrison Formation does not need to be monitored during the injection activities. In addition, the graphics supplied in the documents showing the Morrison Formation

are not to scale thereby appearing to be quite thick -- so it seems to be a purposeful way to mislead the public.

It should also be noted that Azarga's pump tests in the Dewey area were done differently and at a pumping rate of 16 times lower than the previous TVA test was done in this aquifer. If the purpose was to show that no connections exist between formations in the Dewey area, this would be the way to conduct such tests. Therefore, BLM should require that Azarga conduct pump tests in the Dewey area that is more comparable to the previous TVA tests before it can approve this proposed POO.

Research by Wicks, Dean, and Kulander ["Regional tectonics and fracture patterns in the Fall River Formation (Lower Cretaceous) around the Black Hills foreland uplift, western South Dakota and northeastern Wyoming," 2000] indicated that the Fall River formation is "pervasively fractured" along the western edge of the Black Hills. The opinions of Dr. Robert Moran and Dr. Hannan LaGarry, which were previously submitted to NRC, also indicate that fractures, faults, breccia pipes, and other geological characteristics of the project area, have not been adequately researched. The documents say that there are 64 drinking water, irrigation, and livestock wells in or within 1.2 miles of the mine boundary. To families on the ground, the situation confronts their long-term health is a high-stakes manner. It is critical that the geology of the area be fully understood before the BLM can approve this proposed POO.

Research by Tank in 1958: "Clay Mineralogy of Morrison Formation, Black Hills area, Wyoming and South Dakota," *Bulletin of the American Association of Petroleum Geologists"* may be the only focused research on the Morrison formation in the Dewey-Burdock area. It indicates that the formation's thickness varies widely and that there is a "marked difference" between the formation's composition in Edgemont itself vs. seven miles north of Edgemont.

Given the other information that is available and the importance of this particular issue, it is irresponsible for the BLM to approve this proposed POO because Azarga's assertion that mining fluids will be contained is based on very limited scientific information and weak analysis. Accurate and substantial third-party and peer-reviewed information must be obtained and analyzed thoroughly before the BLM approves this proposed POO.

EPA's previous Class III draft Area Permit required Azarga to conduct post-restoration monitoring to demonstrate that no ISL contaminants would cross the aquifer exemption boundary. Azarga is required to develop a reactive transport geochemical model to evaluate the potential for the ISL contaminants to cross the downgradient aquifer exemption boundary, to develop a Conceptual Site Model (CSM), and to conduct targeted monitoring to calibrate the model. However, this is a major step in the wrong direction. Azarga's proposed elimination of down-gradient compliance boundary wells and post-restoration monitoring, and to replace them with a conceptual model is plainly wrong. Replacing physical monitoring with model-based extrapolation is a bad idea because models are not able to accurately depict the real world, especially in a complex hydrogeological environment like this area of the Black Hills. Both down-gradient compliance boundary wells and post-restoration monitoring should be kept as requirements of this project. Therefore, BLM should not approve this proposed POO.

3. ISSUE OF RELIANCE ON OTHER PERMITS

A glaring problem with Azarga's proposed POO is that large portions of it are still based on other permits that do not exist or that were never approved. For example, Azarga's proposed POO defers repeatedly to the NRC's Supplemental Environmental Impact Statement (SEIS) for the Dewey-Burdock project. This document simply echoed Azarga's other submissions, but the NRC never actually took a critical look at these issues. The documents also refer repeatedly to the requirements of a state NPDES permit that has not even been applied for. And they frequently refer to a state Large Scale Mine Permit and a state Groundwater Discharge Permit (GDP) that are far from actually being issued.

To rely on non-existent regulatory instruments and what are essentially Azarga's own documents for large part of this proposed POO indicates both problems with the regulatory process and a lack of analysis of the proposed mine, especially the deep disposal wells, and the aquifer exemption. These non-existent "permits" are relied upon for major aspects of the proposed mine and its associated facilities. For example, the GDP and NPDES permits are relied upon for statements that the land waste disposal option will be safe and that there will be no contamination. This runs counter to the real world situation regarding this issue, which indicates a build-up of highly-toxic selenium at similar sites. Another problem is whether Azarga should obtain approval of their proposal to grow crops on proposed land disposal sites without any analysis of the safety of this practice for wildlife, domesticated animals, or humans.

Similarly, it's wrong to rely on an "NPDES permit" that has not even been applied for to discuss the Emergency Preparedness Program and Environmental Management Plan and as a basis to discuss impacts from spills and leaks, worker safety, and other topics. The EPA concluded that there won't be impacts to land use: "Because the project site will be reclaimed and released for unrestricted use." It's a long way from a non-existent 'permit' to full reclamation perhaps twenty years in the future. This use of speculative information should not be allowed as part of this proposed POO and is further reason that BLM should not approve it.

4. ISSUE OF INADEQUATE CORRECTIVE ACTION

The purpose of the monitoring wells is to identify and assess impacts of ongoing uranium recovery operations and detect fluid movement out of the approved injection interval, should such an event occur. The proposed corrective actions required in EPA's Class III permit are totally inadequate in stating that: "If wellfield pump test results indicate a possible breach in a confining unit that cannot be located for corrective action, or corrective action does not completely repair the confining zone breach, then the monitoring well system shall be designed to verify that wellfield injection interval fluids will remain within the approved injection interval per 40 CFR § 144.55(b)(4)." This is the worst kind of circular logic. Furthermore, to require Azarga to develop "operational controls" as a method of achieving the corrective action is pure nonsense. Part III on Corrective Action only deals with problems that may occur when breaches are detected during pre-operational wellfield delineation and pump testing. There is absolutely nothing in the proposed Corrective Action that states what Azarga should do during the subsequent operational period should a problem occur in which contaminants are detected in one of the monitoring wells (either vertically in one of the confining zones or horizontally outside the authorized wellfield area). In this case, the first thing that Azarga should be required to do is to shut down the entire system and the site restoration process should begin

immediately while the problem is still being investigated. These simple basic requirements should be included in the Corrective Action section because any potential breach in containment would be highly impactful and must be addressed immediately.

Another issue that should be addressed is that one set of monitoring wells is insufficient. In the nuclear industry, redundancy is always built into systems so they are practically fail-safe. The same thing is needed by this proposed POO. Therefore, another ring of monitoring wells should be required to be installed outside the first ring (in the horizontal direction at least) in order to provide a second line of defense. So if and when an exceedance is detected in the first ring of monitoring wells, then it will be possible to have sufficient time to evaluate the proper course of action needed to address the situation while still maintaining adequate monitoring via the outer ring. Due to these inadequate Corrective Action procedures, the proposed POO should not be approved.

5. ISSUE OF SUBSURACE RESTORATION

According to the proposed POO, after the uranium recovery process has been completed in a wellfield, the groundwater restoration process begins for that wellfield. The contaminated groundwater is pumped from the wellfield and treated using reverse osmosis (RO). (See concerns about RO treatment in a subsequent section.) Then it's proposed that the restoration *bleed* and the reject water from the reverse osmosis treatment be injected into the Class V deep injection wells.

However, a critical issue not addressed by Azarga is whether the subsurface can ever be restored after the ISL mining operation shuts down. Otten and Hall of the U. S. Geological Survey are among those who have observed that "To date, no remediation of an ISL operation in the United States has successfully returned the aquifer to baseline conditions" ("In-situ recovery uranium mining in the United States: Overview of production and remediation issues" (http://www-pub.iaea.org/mtcd/meetings/PDFplus/2009/cn175/URAM2009/Session%204/08_56_Otton_USA.pdf). Bill Von Till of the NRC issued similar sentiments when he said in August 2010 "to date, restoration to background water quality for all constituents has proven to be not practically achievable at licensed NRC IS[L] sites" (credited in another source to EIS for Moore Ranch ISL project, WY., p. B-36). This is important because when companies cannot restore water to baseline conditions or to the standards set by the NRC, the NRC typically just raises the amount of contamination allowed. At some point, the restoration water quality fits those raised standards, and the mine's water is declared 'restored'. This is unacceptable for the NRC, and it is equally unacceptable for Alternate Concentration Limits (ACLs) to be established in this fashion. It's important that standards are set at the true 'baseline' (the original condition of the project area's water prior to uranium drilling or mining), and that baseline permit limits are retained throughout the restoration process.

Given these experiences in the current real world of ISL mining in the US and the presumptions of companies who propose this type of mining, it is imperative that BLM approach these permits with abundant caution. If no ISL mine in the US has ever returned the water to baseline and if restoration to background has proven to be not achievable, what makes the BLM believe that this unprecedented task will be accomplished by Azarga at Dewey-Burdock site? This question must be addressed explicitly and analyzed thoroughly as a result of a full NEPA process before the BLM can approve this proposed POO.

6. PROCESS ISSUES

One of the key issues with this proposed POO is the seemingly contorted way in which what is clearly a Class I well has been defined by EPA as a Class V well. The disposal would clearly take place above a USDW, in the Madison formation, which is a large aquifer that is broadly used in the Black Hills. It is used by several cities including Edgemont and Rapid City. The labeling of Class I wells as Class V wells is rationalized by treating them as Class I wells for construction and monitoring purposes and by requiring Azarga to treat the injectate until it is "at or below radioactive waste standards." In numerous public hearings, many people in the area have expressed their fear that this is insufficient because they believe the risk of our water becoming irreversibly contaminated is just too great.

The other glaring process issue is that the BLM has rushed this proposed POO approval process. This is just like the EPA that issued draft permits for Class III wells for an ISL uranium mine for the first time and it also seemed to be in a hurry to do so. There apparently have been extensive private and behind-the-scenes discussions of the process with Azarga and the uranium industry in general, resulting in procedures, guidance, and documents upon which this POO is based. The proposed POO often mimics other documents, including those from Azarga, rather than creating a thoughtful analysis of the situation. Only de facto criteria and regulations have been created because BLM has conducted no public process (including public hearings and analysis of public input). This violates the Administrative Procedure Act (APA), as well as the spirit of American government. If allowed to stand, the entire process fails to fully consider the project and to provide adequate public input. This would leave western South Dakota with contaminated water, set a bad precedent for future proposed projects, and violate the APA. Again, because Azarga has not addressed these process issues adequately means that BLM should not approve this proposed POO.

7. WASTEWATER TREATMENT ISSUES

One critical issue not adequately addressed in this proposed POO is that no analysis or discussion of whether it is even possible to treat the quantity of water being generated by this project to the required standards. If it is not and if the process is not closely monitored, then water will be permanently contaminated. There is no analysis or discussion of whether it is possible to treat the water quickly enough to keep up with the injection rate proposed by this project.

There is also no analysis or discussion of the reverse osmosis (RO) facilities, their location(s) in the project area, or the impacts they would bring. Included in the Class V Fact Sheet is the assumption that at least 30% of the water put through the RO process typically becomes waste water. However, RO units really use approximately three times as much water as they treat (ref. https://www.BLM.gov/ sites/production/files/2015-11/documents/2005_11_17_faq_fs_healthseries_filtration.pdf). So an estimate of wastewater generation is more likely three to ten times higher that stated in the draft permit. And this wastewater is basically brine that will be radioactive, full of heavy metals, and will require further treatment before being disposed of as 11e waste. Even if the RO treatment is feasible, there is also the question of whether RO treatment of all this water can be done economically given the other project costs and the current price of uranium. The BLM should require Azarga

to include a full description and discussion of the RO process and its impacts on the environment, waste treatment, bonding requirements, and its feasibility before approving this POO. It should also require Azarga to provide numerous examples of places in which this process has successfully treated such wastes at the flow rates and with the contaminants as proposed by Azarga.

In addition, membranes from the RO process typically last only two to five years, even with adequate pre-treatment and routine maintenance. (https://www.BLM.gov/sites/production/files/2015-08/documents/reference_guide_to_treatment_technologies_for_miw.pdf) What happens to these membranes when they are no longer usable and how must they be disposed of?

At the end of the day, if the RO process and the actual costs of full aquifer restoration were considered, this project would not be feasible economically, either technically, or environmentally. The history of the uranium industry includes abandonment of almost 200 mines and prospects in the southern Black Hills and over 3,000 in the Upper Missouri River basin, plus thousands more in the Southwest. Given this history, Azarga should be forced to provide an economic analysis using current uranium prices that shows that this project is feasible before they are given any UIC permits or an aquifer exemption. They should also provide a copy of a contract with a buyer for the uranium that would be produced at the mine. Even at a modern ISL mine, such as the Smith Ranch-Highlands mine in Wyoming, aquifer restoration took place for 10 years, and the water quality was about the same as when mining ended – it did not achieve adequate restoration, according to a Violation issued by the Wyoming Department of Environmental Quality. It appears that Smith Ranch-Highlands was allowed to stop remediation mainly because of high costs. Such a situation should not be allowed to happen again at Dewey-Burdock. Therefore, BLM cannot approve this proposed POO until strict and regular on-site regulatory enforcement is included.

8. ISSUE OF KEY TESTS THAT MUST BE COMPLETED BEFOREHAND

The proposed POO also wrongly leaves the completion of key tests until after the permits are issued, including the following:

- wellfield delineation drilling;
- establishment of current water baselines;
- identification of faults;
- tests of the integrity of the confining zones,
- identification of leakage in the Fuson confining zone,
- how to deal with a 10" diameter leaking TVA well;
- information on unsaturated groundwater flow -- this must be done in real life testing, not using a model that can be easily manipulated;
- collecting drill cores to determine the characteristics of down-gradient aquifers' geochemistry;
- measurement of confining zone thickness;
- all of the work leading up to and including the Injection Authorization Data Package Reports;
- radiological impacts analysis – must be independent of Azarga's analysis;
- demonstration of the effectiveness of vertical and horizontal monitoring systems;
- identifying and creating a contract for disposal for 11e wastes and solid wastes;

- the establishment of down-gradient compliance boundary wells -- these should not be moved in case of an excursion, but must be maintained in their original locations;
- and, pump tests.

These key tests must be completed BEFORE the BLM can approve this proposed POO.

9. ISSUE OF FINANCIAL ASSURANCE

Based on the history of the uranium industry, it is plainly clear to any non-biased agency that uranium mining cannot be done safely. So having adequate financial assurances in place is an absolute imperative before BLM can approve this proposed POO.

Documents say that demonstration of financial responsibility by Azarga should be done through a surety bond "or other adequate assurance." However, the only assurance that should be accepted is an adequate surety bond. The value of Azarga's company, if there is any, should not be relied upon to demonstrate financial responsibility. In addition, the definition of an "adequate" surety bond is critical. As noted above, in western South Dakota and elsewhere, it is common history that uranium and other mining companies have been unable to fund full restoration after mining. Indeed, it has been demonstrated that restoration is not even technically feasible, so it is highly likely that Azarga will go bankrupt and leave the cleanup burden on taxpayers – not something the BLM should allow to happen by approving this proposed POO.

Another key issue is that the amount of financial assurance required of Azarga by EPA's two UIC permits is too low by a wide margin. To be based *only* on the plugging and abandonment costs (in the case of potentially thousands of Class III wells [$583,620 for only the first year of operations] and in the case of the two Class V wells [$371,160]) for a total of only $954,780 is absolutely ludicrous! The actual amount of liability represented by this operation will be many, many times this amount.

For example, in one case of ISL uranium mining at the Highland and Smith Ranch, the Wyoming Department of Environmental Quality (WYDEQ) raised the bonds from $38,416,500 to $80,000,000, after it discovered that restoration attempts were not having any effect. In its March 10, 2008, Notice of Violation, the WYDEQ indicated that the real cost of restoration would be "on the order of $150 million." The BLM should heed the Wyoming experience and insure that bonds for all activities that are associated with this technology are adequate, especially since full restoration has never happened at any ISL in the US. Based on this information, BLM needs to require that Azarga post a surety bond for this project of at least $200 million so as not to be on the hook for a significant portion of the remedial action that will be required in the future.

This is especially important because Azarga has already admitted that its restoration is likely to be incomplete. In a 2014 "Restoration Action Plan" submitted to the NRC, Azarga said that "elevated concentrations above the restoration criteria may remain in the production zone following restoration," which Azarga called 'hot spots'. Azarga suggests that, after further study, these 'hot spots' could be ignored and the well field be 'declared restored'. This is unacceptable, and the BLM should explicitly prohibit this practice by not approving this proposed POO.

In another example, what occurred at Wasta, SD, about 50 miles east of Rapid City, should also not be allowed to happen. There, a drill bit and a 150 ft section of equipment broke off when a driller was looking for oil. SD's bond was wildly inadequate (*Rapid City Journal*, January 23, 2017 and March 17, 2017). A similar situation occurring here means plugging the resulting hole may be impossible and would create a link between the Minnelusa and Inyan Kara formations. BLM should not be willing to take the risk that something similar might happen at the proposed Dewey-Burdock site because it would actually be much more catastrophic. Therefore, the BLM should not approve the proposed POO.

10. DRAFT CUMULATIVE EFFECTS ANALYSIS ISSUES

Issues involving the Cumulative Effects Analysis (CEA) document will be discussed in this section. Several important issues are missing from this CEA. Two of the most glaring issues are the presence of other uranium companies in the Black Hills and the potential for uranium mining to expand onto Azarga's contiguous claims on the Wyoming side of the state line (the Dewey Terrace project) and to the east on National Forest Service land. It's important to consider climate change, but it's also important to consider cumulative impacts that are on or adjacent to the proposed mining site.

The CEA is vague on key aspects of the impacts that will occur to ground water quality in the ore zone. One sentence in this section is particularly troublesome, saying: "During groundwater restoration, Powertech [Azarga] will monitor groundwater using standard industry practices to determine the progression and effectiveness of restoration." These standard practices, of course, have been associated with all sorts of problems, including the ongoing failure to return even one ISL mine's water to baseline. This alone is sufficient grounds on which BLM can rely for not approving this proposed POO.

Similarly, another sentence in this section states that impacts to ore zone water quality after completion of groundwater restoration should be minimal. But how is "minimal" defined? Is it minimal to Azarga or is it minimal to the impacted communities? This term "minimal" must be better defined according to what must be achieved from a regulatory standpoint.

The statement in section on Excursion Control which says: "If wells are still on excursion status at the time the 60-day report is submitted to NRC, and the financial assurance option is chosen, the wellfield restoration financial assurance obligation will be adjusted upward" is also quite bothersome. How much "upward" will NRC adjust the financial assurance obligation? How will this be determined? Will the BLM be involved in helping to set the appropriate amount?

Because these documents by Azarga downplay the amount of water that would be consumed by this project, the cumulative impacts do not adequately consider the proposed project's use of large amounts of water. As a result, the proposed POO does not adequately consider the actual drawdown of water or the long-term impacts that this water use could have on the environment and economy of the southwestern Black Hills. The southern Black Hills is a semi-arid area that will need all its ground water in the future. This need will grow with climate change and with the ongoing depletion of the High Plains (Ogallala) aquifer a bit to the south.

Another major problem in the proposed POO is the admission that injectate from the Class V wells will mingle with Madison aquifer water and come to the surface at Cascade Springs, about 20 miles away. While the CEA says this will happen "on the scale of once every 10,000 years," remember that calculations of water movement below the site vary widely. The information presented in the documents indicates that Azarga apparently believes that water movement is many times slower than other independent estimates. Other wells into the Minnelusa and Madison aquifers to the south and east exist over the 20-mile span between the project site and Cascade Springs. This admission should result in the BLM not approving the proposed POO.

There is also a question about the rate of pumping of water during the mining operations. The CEA says that the "header piping [would be] designed to accommodate injection and production flow rates of 2,000 gpm…." Then it says that each header house will service up to 20 production wells and 80 injection wells. The schedule for the project indicates that as many as five wellfields will be active at one time. And each wellfield is likely to have more than 100 wells, so this adds up to more than the 8,500 gpm that Azarga is asking to use. This amount of water is huge and its cumulative effects need to be carefully researched and analyzed before this proposed POO is approved.

Much of the mitigation sections appears to be vague, incomplete, or based on stock language picked from other documents, such as the discussion of soil impacts mitigation in the CEA. The mitigation sections in the documents should offer a complete and detailed analysis of the required mitigation that is site specific at the Dewey-Burdock location. To top it off, the CEA is difficult to review as it has neither a Table of Contents nor an Index. In the future – and before further action is taken on the proposed mine – BLM needs to rectify this and the other omissions as noted above.

In addition, many key aspects of this CEA rely upon non-existent "permits." Examples are almost too numerous to count, but suffice it to say that unless these non-existent "permits" are actually issued, information based on them should be omitted from the proposed POO. This CEA as written is neither realistic nor complete and should therefore be re-done before the proposed POO can be approved.

One statement that "radon-222 itself has very little radiological impact on human health or the environment" runs completely counter to what is common knowledge. It certainly runs counter to BLM's own website on the topic: https://www.BLM.gov/radon/health-risk-radon. The proposed POO needs to go back to the drawing board and a comprehensive, science-based analysis of this issue needs be done.

Along the same line, in its discussion of the Central Processing Plant, the CEA says that "ventilation systems will exhaust outside the building" and that there will be "open doorways" on processing buildings. It should be specified that, for the safety of workers, the open doorways are nowhere near the exhausts and that employees should be fully informed of this situation.

The treatment of radiological wastes from the drying cycle at the Central Processing Plant is not specified. The CEA says: "The off-gases generated during the drying cycle will be filtered through a baghouse…" and it also mentions a "sock filter." However, the document does not give any information on where or how the wastes collected in the baghouse or sock filters would be disposed. It is assumed that these wastes will be radioactive, so will probably be 11e

wastes. But the public should not have to guess about such things. This situation should be the subject of comprehensive analysis, and the entire waste cycle should be specified clearly. There is also no discussion of potential accidents during processing (which have occurred historically at other sites) or the remediation or mitigation that might be needed as a result.

The sections on ground water use in the draft CEA overly rely on the opinion of one person, the former South Dakota State Engineer. Other people should also be consulted. Another problem that has been common in the mine area and that is omitted from the proposed POO is the subject of wildfires. At least three large wildfires have occurred in the area during the last eight years. The Crow Butte ISL mine – only about 65 miles from Dewey-Burdock -- was evacuated in 2012 due to a wildfire. The impacts on water, air, and land could be enormous, if a building containing nuclear materials, wellfields, or storage ponds were impacted by a wildfire. The discussion of cumulative effects must include a thorough discussion of how this type of problem would be dealt with to protect the land, air, and water.

11. NATIONAL ENVIRONMENTAL POLICY ACT ISSUES

A major issue against this proposed POO is the failure of the BLM to adhere to the National Environmental Policy Act (NEPA) process. While the NRC has attempted to follow that process for the possession of nuclear materials, its actions have not adequately covered a variety of issues, particularly water issues. The BLM needs to complete its own NEPA process before granting approval of this proposed POO.

Azarga's project has also changed in many important respects between the time the NRC began considering it and the time the BLM began considering it. Examples include:

- NRC original documents consider the use of 4,000 gallons of water per minute (GPM) for the mining and reclamation process. The current EPA revised draft permit indicates that the expected use of water to be 8,500 GPM, almost twice as much! This is equivalent to withdrawing over 12 million gallons per day, a huge amount to be taken from the area's limited water resources.
- This project was originally described as involving 1,500 injection, recovery, and monitoring wells. The current documents indicate that this number is more than 4,000 wells, which are nearly three times more wells than originally given.
- The projected bleed rates have varied over time, from 0.5% of the water used to 17% of the water used currently. In addition, the reverse osmosis process makes at least 30% of the water put through the RO process into waste, and this is not fully considered in the POO and seriously weakens all the assumptions and calculations used as its basis.
- Documents prepared by Petrotek for Azarga set subsurface water movement rates at 6 to 7 feet per year (without offering peer-reviewed sources). NRC documents set the transmissivity rate in the Fall River formation at 255 ft. per day and in the Lakota formation at 150 ft. per day. Dr. Perry Rahn's 2014 article, mentioned above, concluded that the average ground water velocity for the Lakota and Fall River formations in the Dewey-Burdock area was 66.1 ft. per year. However, he said that he considers groundwater velocity in the Inyan Kara Aquifers at the Dewey-Burdock site to be "very high," and it could be expected to be as much as 5,480 feet per year – over a mile! This rate "might indicate fast groundwater movement through very permeable units or through fractures." However, this critical information that can have very real impacts on

wells that are downgradient of the proposed mine site was not included in the POO, so further independent studies should be done before this proposed POO is approved.
- Azarga talked about the possibility of doing open pit mining at the NRC hearings, but this possibility is not raised in the POO, so it cannot be resurrected in the future.

Such changes in parameters of the proposed project go to the heart of the information contained in this proposed POO. The NRC and the BLM have had different projects submitted to them. The processes are not functional equivalents, and consideration of both projects would not be redundant – it would be sensible. The BLM should begin a thorough NEPA process to assess the project as it is currently proposed.

The BLM must also do a thorough tribal consultation. The existing documents indicate that this process has barely begun, and yet Azarga has submitted this proposed POO anyway in hopes of getting BLM's approval. This makes a mockery of the consultation process, which should be completed well before draft permits are issued, so that the resulting information can be analyzed. The BLM must halt all further action until mutually-satisfactory, government-to-government consultation is completed. All cultural and historical properties must be identified by Lakota experts, who should be paid if they so desire, and given complete protection.

12. ENDANGERED SPECIES ACT ISSUES

Documents in the proposed POO state that the Endangered Species Act will be complied with, but gives no information on how it intends to do this. When will this be done? What species will be considered? Who will do the analysis (surely not Azarga)? This should already have been completed by Azarga before the proposed POO was even submitted to the BLM.

The documents mention the presence of a short-horned lizard, which is rare and protected in South Dakota, in the proposed project area. After stating that the species is "important in some tribal cultures," it offers the solution that after construction activities begin at the site, it is expected that any short-horned lizards that were in the area will seek less disturbed locations. However, this is pure conjecture, without any back-up information on the size or habits of the lizards. Are they territorial, or is it species-appropriate for them to move? Are they large enough to move fast enough to out-run a bulldozer or pick-up truck? Or are they, in reality, unprotected?

This and similar information must be provided and backed by scientific research at the Dewey-Burdock site for this and other species. Animals should not simply be expected to move out of a site that's over 10,000 acres in a systematic and comprehensive process. And the BLM should not be satisfied that they can be 'expected' to just move back in after mining is complete – as if the same animals will be alive and remember their former homes after as many as 20 years. This is certainly beyond unacceptable – it is actually ludicrous!

Species other than animals are not considered in this discussion. Plants cannot simply move off the site. Some of them are important to tribal practices and customs, such as medicinal plants and timpsila (prairie turnips). Full scientific information should be gathered, and full analysis must be done, for non-animal species. Species that are important to the long-term residents of the area -- the Lakota, Cheyenne, and other native nations – require special protection. There is already information on protection of some species in project documents

that could serve as a base for part of this analysis. However, a full and independent analysis is also needed.

This analysis would include close consideration of the opinion of the SD Department of Game, Fish and Parks. This opinion was stated in an October 17, 2008, letter written by Stan Michals, who said that exploratory activity should not take place on some parts of the project area between February and August (inclusive) due to the presence of a bald eagle nest (a state-protected bird) and a redtail hawk nest. So mining, deep disposal wells, land application, and reclamation (which are more long-lasting and disruptive than exploration), should clearly not take place during those seven months of the year in raptor nesting and other protected areas.

The sturgeon chub must be included in the discussion of wildlife concerns. It is present in the Cheyenne River and may be threatened or endangered in areas downstream from the proposed mine. Additional silt, heavy metals, and radioactive materials would be additional potential threats.

13. OTHER ISSUES

There are many other issues with Azarga's documents and statements that are contained in this proposed POO which should give the BLM serious pause before approving it. For example, it talks about ten 'wellfields' in the Burdock area and four 'wellfields' in the Dewey area. But the POO has not set a limit of how many actual injection and production *wells* Azarga may actually construct. However, a limit of the number of wells should be set (and this limit should be a conservative number) before the BLM approves this proposed POO.

This proposed POO should specify that the various ponds proposed for this project should not be built where there are old drillholes. Best practices should be followed for all ponds to avoid leakage either through the bottom or through flooding, including the following minimum requirements: thick, high-quality double liners, clay liners, leak detection systems, procedures for frequent checking of leak detection systems, and the maintenance of substantial empty space in the ponds to accommodate flood events. Also, building ponds in the 500-year floodplain, especially given the increase in flooding incidents in the area, should not be allowed. Similarly, the design of sediment control structures should protect from events larger than a 5-year, 24-hour precipitation event – especially because the mine and the ponds will possibly exist for decades. And given climate change, a 100-year, 24 hour precipitation event should be set for design purposes to prevent spills from these ponds. Statements in the proposed POO that surface water impacts "should be minimal" are concerning. Impacts will not be minimal if a flood washes out sediment structures or over-tops a pond containing hazardous materials even once.

All boreholes and old uranium mines in the project area should be plugged and reclaimed before any further mining is allowed. Not only does this protect the water, soil, and air of the area, but it also protects workers who would be exposed to the old, open mines. Abandoned open pit uranium mines spread contamination through the water, sediment, and air, as shown by research done by Dr. James Stone of the South Dakota School of Mines and Technology and others. The old mines must be reclaimed, and the soil, air, and water must be tested to insure that it is safe before allowing any new uranium mining project to go forward.

In addition, properly calculating the injection zone critical pressure rise is crucial to be able to safely operate the deep disposal wells. It is apparent that certain assumptions can widely vary the critical pressure rise results. Azarga's assumptions about critical pressure values in the Madison Formation are inadequate. For this reason, more oversight is needed rather than simply letting Azarga recalculate the critical pressure rises for each of injection zone based on the site-specific information collected during the construction of each well. The proposed POO should be changed to say that if the resulting injection rates are even near the critical pressure, correction action must be taken immediately. It is vital to protect the Madison aquifer due to the nature of the upper portion of that aquifer and the presence of rapid water movement in it.

The proposed POO acknowledges that injection into an USDW is not authorized, so Azarga must demonstrate that the Minnelusa injection zone is not an USDW. However, Azarga has not done the work necessary to prove that the Minnelusa injection zone is not an USDW, so this proposed POO cannot be approved on this basis alone until such work is done.

Deep disposal well integrity should be tested at least once per year, not as infrequently as every five (5) years, as proposed by EPA and referenced in the proposed POO. Injectate should also be monitored and analyzed regularly, as the characteristics of wellfields will differ -- and therefore, the functioning of the RO system may also vary in effectiveness. Records should be maintained until at least five years *after the end of the project*, in case problems develop over time -- not for as little as three years, as specified in the POO documents.

Also modeling is a weak alternative to on-the-ground testing. The proposed POO should not rely exclusively on models for any decision or requirement in the case of such a complex, controversial project – especially not on models developed by or for Azarga. There should be independent analysis of any information currently left to modeling. As the Cumulative Effects Analysis notes: "there is inherent uncertainty in the results" when modeling is involved.

The length of time that the proposed Dewey-Burdock project would be active should be clarified. This goes directly to the potential impacts of the project. The estimate in the State Mining Permit Application is seven to 20 years of uranium recovery, maybe more, with the Central Processing Plant likely to operate longer. EPA's Class III draft permit is for the "operating life of the facility." So with 14 wellfields, each operating for two years, this could be as long as 28 years, if Azarga ran them consecutively. This contrasts to the 'about 16 years' of operation as stated by Azarga in this proposed POO. There is also the potential that Azarga will try to expand the project to include its contiguous claims to either the east or west of the current project area. There's a big difference between regulating a project that lasts seven years and regulating a project that lasts 28 years, so the POO should discuss the full range of potential impacts and scenarios.

A number of statements in the proposed POO and its supporting documents make it apparent that the agencies are acting subjectively in many cases rather than factually – basically where ever the word "expected" is used. Example statements that do not instill confidence are those such as: "The overlying confining zone for the Lower Chilson is expected to provide adequate confinement…" and "The uranium ore is located in the Lower Chilson sand unit, which is expected to be locally hydraulically confined in the area of Burdock Wellfield 6…" and "The proposed injection zone for injection wells DW No. 2 and DW No. 4 is the Deadwood Formation, which is expected to lie beneath all USDWs in the area." Given the critical nature

of this project, many of these statements should, instead, be made factual. Such statements should be scientifically proven, not 'expected' into existence.

The statutory analysis states that the Dewey-Burdock mine is subject to the Clean Air Act and subpart W. So if the project goes forward, public education sessions and public comment periods will be required as part of the subpart W regulatory process, but this is not addressed in the proposed POO and is another reason it should not be approved.

Much information will not be subject to public review or comment, and key information would become available only after permits have been granted. This turns the regulatory process on its head. All testing should be done and subject to both professional and public reviews before this proposed POO is approved. In fact, it should contain a provision making all information public.

In addition, the current conditions do not provide an adequate or accurate 'baseline'. All baseline measurements (ground and surface water, air, soil, sediment, etc.) should be defined as the original condition of the project area, before any drilling or mining occurs.

Given the nature of the ISL uranium industry, the proposed POO and its supporting documents must include a discussion of the uranium industry's record in relation to problems with the ISL process at other sites. This lack of discussion minimizes the many problems that the ISL industry has experienced, and thus the potential problems at the Dewey-Burdock project. It makes the portions of the draft permit dealing with excursions and leaks inadequate, as well as sections about mitigation and reclamation. For example, the Crow Butte ISL mine near Crawford, NE., has had many (>85) license violations and reportable incidents. These range from excursions to leaks and spills to wells failing integrity tests. One leak at this site was not found or dealt with for more than two years, which makes a mockery of the POO's reliance on gauges, sensors, alarms, and other hardware to identify leaks and related system problems.

If BLM staff reviews information about ISL mines and regulations at http://www.wise-uranium.org/umopusa.html (WISE Uranium, "Issues at Operating Uranium Mines and Mills – USA," last updated April 19, 2017), it quickly becomes clear that excursions are 'normal'. This source also documents the movement of mining fluid beyond the mine boundary at the Kingsville Dome ISL mine in Texas (Rice. 2013. "Excursions of Mining Solution at the Kingsville Dome In-Situ Leach Uranium Mine." (*Austin Geological Society Bulletin)* and the Highland Uranium Project in Wyoming.) A summary of this type of information can also be found at Daniel Simmons-Ritchie, "Troubled history" in the *Rapid City Journal*. September 23, 2013. A history of these issues in the northern Plains region can be found in "Uranium Activities' Impacts on Lakota Territory," in the *Indigenous Policy Journal* (by L. Jarding. 2011). As the former CEO of Azarga said in a public forum in Colorado, leaks from both pipelines and ponds are common. So it's apparent that such an operation would pose great risk to both surface and ground water, further reasons why BLM should not approve this proposed POO.

There are several other uranium companies that have expressed an interest in the Black Hills. One – Peninsula Minerals – started an ISL mine on the northwestern edge of the Hills in Wyoming. If Azarga manages to acquire all the needed permits (at least 10 at last count, including the Clean Air Act permit) and this project proceeds, then this would be the first ISL mine in South Dakota. If Azarga is allowed to move forward – especially based on such a flimsy permitting documents – a precedent would be set. We do not want to open SD to a stampede of ISL uranium mining companies, for all the reasons discussed in this document.

In addition, Azarga has mining claims to the east of the current project boundary, and it has contiguous claims just across the border in Wyoming. This is very clearly a topic that should be considered under any discussion of cumulative effects. Therefore, the BLM cannot approve this proposed POO before it fully considers all the existing mines in the Black Hills and the potential for a much larger number of ISL uranium mines that could be operating in the area.

Another important omission in the proposed POO is that it does not answer the question of who is going to do on-the-ground regulation of the proposed mine and deep disposal wells. In 2011, SD suspended its ability to regulate ISL uranium mining, so it has no authority to do such regulation. The NRC reportedly has only two inspectors based in Texas, who may be able to visit ISL mines perhaps once or twice a year. There is no indication that NRC's regulation can be complete or happen often enough to catch problems -- and this is extremely important! By reference to EPA requirements, this proposed POO includes some very critical actions, such as testing the Minnelusa Aquifer to determine its water quality before deciding whether Azarga can proceed with deep disposal wells. This is a high-stakes test that would impact the future of the southwestern Black Hills. First, the water quality test should have been done under the direct supervision of appropriate federal agencies before BLM can approve this proposed POO. If water in the Minnelusa aquifer turns out to be appropriate for drinking water, the time and expense of creating the application and the Class V injection permit could be avoided – as could the stress on people in the area who use and rely on the aquifer.

The If BLM expects the people who use the Minnelusa Aquifer in the southern Black Hills to believe the results, then rather than allowing Azarga to do a test in the area of its choice, using its own equipment, and sending samples to the lab of its choice, testing of the water in the Minnelusa aquifer should instead be done under the agency's direct supervision.

Similarly, many other items must not be left exclusively to Azarga and must be done under the direct supervision of knowledgeable regulators, including the following:

- pre-mining water quality testing in the proposed mining area;
- testing designed to determine the likelihood of down-gradient excursions;
- information underlying decisions about what holes and wells should be plugged;
- mitigation of air quality impacts;
- pump tests;
- well construction;
- reports on and handling of vehicle accidents involving hazardous or radioactive contaminants;
- groundwater level measurements;
- injection fluid characteristics;
- post-restoration monitoring;
- determination of the corrective response that must be taken when an excursion occurs;
- well plugging and abandonment;
- analysis of radiological issues;
- disposal of hazardous wastes;
- regulation of a variety of soil issues as noted in the Cumulative Effects Analysis;,
- programs to minimize the impacts to land use;
- fugitive dust control; and
- measurements related to the presence, monitoring, and impacts of excursions, and of attempts to measure or cure excursions.

Also missing from the proposed POO is any kind of reasonably believable analysis of the concerns surrounding abandoned uranium mines in the project area. Instead, the POO simply asserts that there are a number of old mines and does not say much about their condition. Two drilling logs indicate the obvious locations of the two larger open-pit mines, but not for the other abandoned mines, and their conditions are simply asserted. Early uranium mining in the southern Black Hills was a "mom and pop" enterprise, and detailed records were not kept. Small abandoned mines or prospects may have escaped being recorded. One potential solution is to allow a non-biased professional, such as Dr. LaGarry, a longer period of time in which to look over the drilling logs. His time was quite limited when he was given access to Azarga's records under an order from the NRC administrative judges.

The permit says Radium-226 will be treated in settling ponds by adding barium, which will cause the radium to precipitate out of solution. This yields a whole host of questions, including how effective is this technology and what becomes of the radium that is settled out? How often do these settling ponds need to be cleaned out and where do the wastes get disposed?

Before BLM approves this POO as proposed, Azarga must rightly show that the TDS concentration in the Minnelusa aquifer is greater than 10,000 mg/L, thus demonstrating that the injection interval is not an USDW. How are the results of these tests going to be communicated to the public?

The proposed POO states that injection fluids are limited to waste fluids from the ISL process generated by this project. These waste fluids include groundwater produced from well construction, laboratory waste fluids, well field production bleed and concentrated brine generated from the reverse osmosis treatment of groundwater produced from the well field during groundwater restoration, and groundwater pumped from any portion of the Inyan Kara aquifers for the purpose of remediating an excursion. However, it is imperative that this requirement is never relaxed by the BLM so that Azarga is never allowed to inject other wastes generated from any off-site location.

The proposed POO also states that groundwater pumped to the surface during the pump tests will not be injected back into the subsurface. The obvious question is what will be done with this waste water? Will it be allowed to run onto the ground and/or into creeks? What will its quality be? Is this waste water included in the calculations of the amount of water consumed during the project? At a minimum, the POO should answer these questions before being approved.

Another omission is simply the failure to provide a very important definition related to mechanical integrity. It says that internal mechanical integrity and external mechanical integrity will both be confirmed if "there is no significant" leak or fluid movement. The document needs to provide a clear, measurable definition of "significant" in each case.

On the topic of drilling, Azarga is required to determine the Minnelusa and Madison aquifer thickness and potentiometric surface elevations at the Madison water supply wells (if drilled). However, drilling a supply well into the Madison aquifer should not be permitted. The upper portion of the Madison aquifer is porous, containing many caves, fractures, and solution openings (USGS. 2002. *Atlas of Water Resources in the Black Hills Area, South Dakota,* pp. 24-25). If Azarga does not install this well properly, there would be no separation between the aquifers and potentially no containment of materials pumped into the deep disposal wells, and a major drinking water aquifer could be contaminated.

Liquid wastes will be treated by the ion exchange columns to achieve radioactive constituent limits as required by the Class V Area Permit. However, if any concentrations are above the limits, the permit states that "effluent will be treated as necessary to satisfy the Table 16 limits." "Treated as necessary" is rather nebulous. If this occurs, what will Azarga be *required* to do in order to satisfy the limits? The next treatment step required here should be specified in the proposed POO rather than leaving this up in the air.

At the end of the day, there is absolutely no need for Azarga to be allowed to construct up to four Class V injection wells. Most ISL sites have only one well, so two should be more than necessary. Azarga should have to go through a complete new application process before being allowed to install more than two Class V wells at the site.

The citizens of the area who would be most impacted by this project have spoken loudly and clearly at numerous hearings in the past that they were opposed to this project. The will of the people should be what counts most in our democracy. So the BLM should act consistently with the voices of the vast majority of the people at these hearings and not approve this proposed POO which is poorly written, ill-advised, full of gaps, and dangerous to the health, the economy, the cultural resources, and the environment of the Black Hills.

In conclusion, we believe that this uranium should be left in the ground at this site because when uranium is mined, it becomes harmful to both the people and the planet. We are concerned about the havoc this project would inflict on our beloved western SD and we do NOT want another huge contamination problem and a future Superfund site to be created here. The Oglala Sioux Tribe respectfully requests that the BLM not approve this proposed POO because it does not meet the applicable content requirements of 3809.401 and proposes operations that would result in unnecessary or undue degradation of public lands.

Comments to Bureau of Land Management on behalf of Oglala Sioux Tribe

National Environmental Policy Act (NEPA) Compliance

The National Environmental Policy Act 42 U.S.C. §§ 4321, et seq. ("NEPA") requires all federal agencies, including BLM, unless specifically exempted by statute, to take a "hard look" at the environmental impacts from all major federal actions. NEPA "prevent[s] or eliminate[s] damage to the environment and biosphere by focusing government and public attention on the environmental effects of proposed agency action." Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 371 (1989).

The Courts - like the Tribes, the public, and all federal agencies - "know that the environmental values protected by NEPA are of a high order -- because Congress has told us so." Oglala Sioux Tribe v. United States NRC, 896 F.3d 520, 529 (2018). Instead of preparing a NEPA document that informs the Tribe and others, BLM points to an outdated ("POO") and NEPA documents prepared in accordance with a Nuclear Regulatory Commission ("NRC") decision and practice that the D.C. Court of Appeals confirmed "are contrary to NEPA." *Id.* at 532. BLM fails to meet its various duties under federal law by relying on "NRC's settled practice to keep licenses in effect, notwithstanding significant NEPA deficiencies, unless an intervenor shows irreparable harm." *Id* at 535. In light of the NRC's NEPA deficiencies, BLM must take action to satisfy NEPA's "'action-forcing' purpose" before taking action on the project proposal. *Id* at 532 *quoting* Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989). BLM cannot satisfy its NEPA duties by inviting comment on the POO and referring to an EIS with "significant NEPA deficiencies" without also violating NEPA's mandate that NEPA documents inform the Tribe, the Tribe's members, the public, and BLM decisionmakers "before authorizing a proposed project." *Id*. The primary, but not only, serious failure was the lack of any competent cultural resources survey anywhere on the proposed Dewey-Burdock site – including on the BLM surface areas proposed for disturbance. BLM must remedy these failings to comply with NEPA. Approving the POO based on NRC's NEPA deficient procedures is not allowed because, "where the slate is not blank, as here, BLM could not act in a vacuum." California v. Bernhardt, 2020 U.S. Dist. LEXIS 128961, at *126 (N.D. Cal. July 15, 2020).

The NEPA process is well established, and not impacted by recent rulemaking, which does not go into effect until September 14, 2020, if at all, based on Congressional Review Act scrutiny of the major rule. 85 Fed.Reg. 43304, 43353 (July 16, 2020). NEPA requires that federal agencies fully consider all direct, indirect, and cumulative environmental impacts of the proposed action. 40 C.F.R. §§1502.16; 1508.8; 1508.25(c). Direct effects are caused by the action and occur at the same time and place as the proposed project. §1508.8(a). Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. §1508.8(b). Id. Cumulative impacts are: "[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." §1508.7. For instance, for mining operations, the agency must

fully review the impacts from off-site ore or waste processing and transportation. South Fork Band Council of W. Shoshone of Nev. v. U.S. Dep't of the Interior, 588 F.3d 718, 725 (9th Cir. 2009). Similarly, because impacts of the federal and state governments' foreseeable failure to ensure radioactive waste disposal facilities for past, present and future ISL projects could require wastes to be "stored on site [...] on a permanent basis," NEPA requires that the action agency "must assess the potential environmental effects of such a failure." New York v. NRC, 681 F.3d 471, 479 (2012).

Federal courts have dealt squarely with situations where a federal agency "says that cumulative impacts from non-Federal actions need not be analyzed because the Federal government cannot control them. That interpretation is inconsistent with 40 C.F.R. § 1508.7, which specifically requires such analysis." Center for Biological Diversity v. NHTSA, 508 F.3d 508, 517 (9th Cir. 2007). For example, an agency was required to consider the impacts of power turbines in Mexico in their EIS reviewing a U.S. transmission line because the projects were "two links in the same chain." Border Power Plant Working Group v. Dep't of Energy, 260 F. Supp. 2d 997, 1016 (S.D. Cal. 2003).

The current NEPA analysis fails to adequately discuss or review the cumulative effects associated with the transport of radioactive byproduct waste material to the White Mesa Mill in Utah. While the documents acknowledges White Mesa is the only foreseeable destination for the waste and includes waste disposal transport in its analysis of local truck traffic air impacts, the document does not review the associated impacts associated with such things as inevitable spills or the associated cumulative impacts at the White Mesa Mill, which has experienced and continues to experience significant problems. Significant environmental justice issues are presented by a project involving radioactive waste impacts in that disproportionately impact Native American Tribes' interests and their members' interests in the Black Hills and in the Four Corners region (*e.g.* Ute Mt. Ute, Hopi, and Navajo) where Energy Fuel's White Mesa disposal facility is located. NRC's practice of approving projects that create radioactive wastes without first addressing temporary storage - and ensuring the project has secured a safe disposal site - is contrary to NEPA. New York v. NRC, 681 F.3d 471, 479 (2012).

The storage capacity at the existing disposal cells at White Mesa mill, if used up by other processing and disposal streams, will result in a default on-site disposal until a disposal site is identified and secured. Basically, BLM's NEPA inadequacies create the same sorry state of affairs that plagues reactor wastes. The licensed-disposal capacity of the White Mesa cells is a valuable (albeit toxic) commodity. A proper impacts analysis is likely to reveal that the disposal capacity required for existing ISL licensees/UIC permittees exceeds existing (and planned) disposal capacity. BLM's NEPA analysis must address this issue, as storage of radioactive material on the site threatens "undue or unnecessary degradation" of BLM-managed surface and subsurface interests of the United States. 43 U.S.C. § 1732(b).

The BLM's NEPA analysis also fails to account for other projects not just in and around the Black Hills, which cumulatively impact the Tribe culturally and spiritually, but also additional projects proposed in close proximity to the Dewey-Burdock property. For instance, Powertech has proposed opening satellite mines, including in the Dewey Terrace area, that would feed the

processing facilities at the Dewey-Burdock site. Indeed, the company is on record specifically stating that the Dewey Terrace project is proposed as "a nearby satellite project, within 10 miles of the Dewey Burdock Project, the Company's initial development priority." See attached Azarga press release dated October 31, 2017 (Attachment 1). This project is in addition to others, such as the Aladdin and Savageton project the company promotes. The impact of these satellite mines must be incorporated into the cumulative effects analysis, at a minimum. NEPA requires BLM to conduct further inquiry and the agency is not allowed to limit its analysis to whatever the proponent submits or comments identify. BLM's compliance with NEPA's action-forcing mandate will confirm Azarga/Powertech are actively pursuing a much larger uranium project that BLM must analyze to avoid unlawful segmentation of the proponent's overall plan into smaller parts involving action with less significant environmental effects. 40 C.F.R. § 1508.25(a)(1). Notably, NRC's NEPA process - and the ongoing adjudication - did not resolve similar questions regarding the proper scope of the proposal and required NEPA analysis and therefore the question of segmentation has not been resolved. BLM is not working with a clean slate, and has a duty to inquire into facts establishing the real scope of the proposal under review. 40 C.F.R. 1508.23 ("A proposal may exist in fact as well as by agency declaration that one exists.")

Azarga/Powertech has long admitted that the Dewey-Burdock facility is proposed to be used as a processing site for ongoing uranium mineral development in the region, even identifying specific projects that would provide future feed the Burdock regional processing/milling facility:

> It is likely that he CPP at the Burdock site will continue to operate for several years following the decommissioning of the Proposed Action well fields. The CPP may continue to process uranium from other ISL projects such as the nearby Powertech (USA) satellite ISL projects of Aladdin and Dewey Terrace planned in Wyoming, as well as possible tolling arrangements with other operators.

See attached Dewey-Burdock Project Application for NRC Uranium Recovery License Fall River and Custer Counties South Dakota Technical Report (excerpt) at page 1-8 (Attachment 2); see also Powertech (USA) Inc. Dewey-Burdock Project Class III Underground Injection Control Permit Application at page 10-14 (Attachment 3).

Powertech has specifically asserted that future processing of ore from the Aladdin and Dewey Terrace facilities are part of the "Proposed Action" included in the Dewey-Burdock license application:

> It is likely that the CPP at the Burdock site will continue to operate for several years following the D&D of the project well fields. The Proposed Action is for the plant to continue to receive and process uranium loaded resins from other Proposed Projects such as Powertech's nearby Aladdin and Dewey Terrace Proposed Satellite Facility Projects planned in Wyoming or from other licensed ISL operators or other licensed facilities generating uranium-loaded resins that are compatible with the Powertech (USA) production process.

See attached Dewey-Burdock Project Application for NRC Uranium Recovery License Fall River and Custer Counties, South Dakota, Environmental Report, February 2009 (excerpt) at page 1-25 (Attachment 4). The handling of these foreseeable waste streams is not addressed, and there has not been an opportunity for public comment.

These foreseeable processing and tolling arrangements, proposed by the proponent in several venues, require a careful analysis of the actual effect of the BLM approval. It is foreseeable that the continuing processing could turn the Dewey-Burdock facility into a *de facto* waste facility, much as the White Mesa mill has transitioned from a uranium mill processes conventional ore into an alternate feed/ISL disposal facility that rarely processes mined ores. NRC, like BLM, has identified the use of a mill for disposal as potentially inviting "sham processing" and cannot ignore this foreseeable, and indeed espoused, aspect of the Azarga business plan. *In the Matter Of International Uranium (USA) Corporation* 51 N.R.C. 9, 2000 NRC LEXIS 21, (N.R.C. February 10, 2000).

Further, the mineral exploration and development activities around the Black Hills should be accounted for in the cumulative effects review, given the spiritual and cultural import Lakota people place on the Black Hills as a whole. For instance, publicly available records demonstrate oil and gas exploration/development operations in the direct vicinity of the proposed Dewey-Burdock project. See attached State of South Dakota approval in Case No. 5-2019 (Attachment 5). BLM must review this, and all similar, projects as part of the cumulative effects analysis. In addition, several gold mining companies are proposing mineral development projects on the east side of the Black Hills, particularly in the Rochford area, which is compounded by the long-standing contamination from the Homestake properties in the same area. Other mining development in and around the Black Hills region must be evaluated, including the Cameco operations in Nebraska and the proposed Bear Lodge rare earth minerals mine.

Also of concern with respect to cumulative effects are those associated with the Black Hills Ordnance Depot. Issues of soil and ground water contamination associated with this site are well documented. The cumulative impact analysis must address potential exacerbation of ground water contamination associated with chemicals from the Depot caused by the proposed Dewey-Burdock project, including ground water pumping both for mining purposes and for freshwater use, along with deep injection disposal.

Lastly, BLM's NEPA analysis fails to discuss the past uranium mining on the Dewey-Burdock property, left unreclaimed, and the associated cumulative contamination potential from those mines. The Darrow/Freezeout/Triangle mines have been the subject of some review by EPA and are recognized as potential pollution sources to groundwater that simply must be accounted for in the cumulative effects review. See attached Preliminary Assessment of Darrow/Freezeout/Triangle mines (Attachment 6). These mines are but one potential pollution source that are contributing to contamination of the Cheyenne River. The Tribe has conducted sampling in the Cheyenne River downstream of the proposed Dewey-Burdock site and found elevated levels of contaminants, including uranium. See attached Cheyenne River sampling data (Attachment 7). EPA must review these, and all other, pollution sources to the Cheyenne River, which may result in cumulative impacts to the water quality in the River when combined with the threats from the Dewey-Burdock project.

The Oglala Sioux Tribe is aware that a more complete list of NEPA issues and violations have been submitted by other parties, including the Black Hills Clean Water Alliance. In order to avoid repetition, the Oglala Sioux Tribe expressly adopts and incorporates the comments submitted by other parties, including the Black Hills Clean Water Alliance as if set forth fully herein.

National Historic Preservation Act

The federal courts have addressed the strict mandates of the National Historic Preservation Act, 16 U.S.C. §§ 470, et seq.:

> Under the NHPA, a federal agency must make a reasonable and good faith effort to identify historic properties, 36 C.F.R. § 800.4(b); determine whether identified properties are eligible for listing on the National Register based on criteria in 36 C.F.R. § 60.4; assess the effects of the undertaking on any eligible historic properties found, 36 C.F.R. §§ 800.4(c), 800.5, 800.9(a); determine whether the effect will be adverse, 36 C.F.R. §§ 800.5(c), 800.9(b); and avoid or mitigate any adverse effects, 36 C.F.R. §§ 800.8[c], 800.9(c). The [federal agency] must confer with the State Historic Preservation Officer ("SHPO") and seek the approval of the Advisory Council on Historic Preservation ("Council").

Muckleshoot Indian Tribe v. U.S. Forest Service, 177 F.3d 800, 805 (9th Cir. 1999). See also, 36 C.F.R. § 800.8(c)(1)(v)(agency must "[d]evelop in consultation with identified consulting parties alternatives and proposed measures that might avoid, minimize or mitigate any adverse effects of the undertaking on historic properties….").

The Advisory Council on Historic Preservation ("ACHP"), the independent federal agency created by Congress to implement and enforce the NHPA, determines the methods for compliance with the NHPA's requirements. See National Center for Preservation Law v. Landrieu, 496 F. Supp. 716, 742 (D.S.C.), aff'd per curiam, 635 F.2d 324 (4th Cir. 1980). The ACHP's regulations "govern the implementation of Section 106," not only for the Council itself, but for all other federal agencies. Id. See also National Trust for Historic Preservation v. U.S. Army Corps of Eng'rs, 552 F. Supp. 784, 790-91 (S.D. Ohio 1982).

NHPA § 106 ("Section 106") requires all federal agencies, prior to approving any "undertaking," to "take into account the effect of the undertaking on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register." 16 U.S.C. § 470(f). Section 106 applies to properties already listed in the National Register, as well as those properties that may be eligible for listing. See Pueblo of Sandia v. United States, 50 F.3d 856, 859 (10th Cir. 1995). Section 106 provides a mechanism by which governmental agencies may play an important role in "preserving, restoring, and maintaining the historic and cultural foundations of the nation." 16 U.S.C. § 470.

If an undertaking is the type that "may affect" an eligible site, the agency must make a reasonable and good faith effort to seek information from consulting parties, other members of the public, and Native American tribes to identify historic properties in the area of potential effect. 36 C.F.R. § 800.4(d)(2). See also, Pueblo of Sandia, 50 F.3d at 859-863 (agency failed to make reasonable and good faith effort to identify historic properties).

The NHPA also requires that each federal agency consult with any "Indian tribe ... that attaches religious and cultural significance" to the sites. 16 U.S.C. § 470(a)(d)(6)(B). Consultation must provide the tribe "a reasonable opportunity to identify its concerns about historic properties, advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, articulate its views on the undertaking's effects on such properties, and participate in the resolution of adverse effects." 36 C.F.R. § 800.2(c)(2)(ii). As such, the Tribe must be involved in all three of these efforts – 1) identifying historic or cultural resources; 2) evaluating impacts on historic or cultural resources and those resources' eligibility for inclusion on the National Register of Historic Places (NRHP); and 3) developing project alternatives or mitigation measures to protect those resources that are or may be eligible.

BLM's request for POO comments contains no indication that BLM complied with the consultation and historic resources protection requirements of the National Historic Preservation Act, and the Tribe is not aware of any BLM attempt to address significant impacts to the historic and cultural resources. Indeed, on August 21, 2020, President Running Bear sent a letter requesting BLM to conduct government-to-government consultation in coordination with EPA. (Attachment 8). Specifically, there has never been conducted a competent Lakota cultural resources survey of the Dewey-Burdock site. This has been the incontestable fact since the Nuclear Regulatory Commission's Atomic Safety and Licensing Board (ASLB) issued its ruling in LBP-15-16 in 2015. *In The Matter of Powertech (USA), Inc.* (Dewey-Burdock ISR Project), LBP-15-16, 81 NRC 618 (2015). This ruling has been repeatedly upheld by both the ASLB and the Nuclear Regulatory Commission itself. As such, without a competent cultural resources survey and analysis of the property, there is no way for the BLM to meaningfully consult with the Oglala Sioux Tribe – or any other Tribe – as to the identification, evaluation, or mitigation of impacts to those cultural resources. NRC Staff's abject failure to meet the federal government's obligations to ensure a competent cultural resources survey and analysis means that BLM is legally obligated to do so before taking any action that would approve the proposed POO. The Tribe remains ready, willing, and able to assist in this effort – short of being asked to expend its own resources to pay professional survey staff, as NRC Staff has wrongfully attempted to date. Given that NRC Staff affirmatively divorced its NEPA process from any NHPA process, including consultation efforts, and failed to include any competent analysis of cultural resources impacts in the FSEIS, BLM simply cannot rely on the FSEIS process to satisfy its own NEPA and NHPA obligations. In short, BLM may need to allocate the funds to meet its NEPA and NHPA duties, but a federal agency's funding priorities do not provide an excuse for BLM to ignore the duties NEPA imposes on all federal agencies.

It appears BLM signed on to the Programmatic Agreement (PA) developed by NRC Staff in order to attempt to fulfill its NHPA duties. However, the Tribe is not aware of any agency documents that confirm BLM took any action besides signing the PA. Regardless, the lack of a

competent cultural resources survey has poisoned the Programmatic Agreement such that it is not a viable means for NHPA compliance. Specifically, the PA was finalized in 2014 at the time NRC Staff issued its Record of Decision for its licensure process for the project. As a fundamental basis for the PA, that document states in its recitals that "WHEREAS, surveys to identify historic properties have been completed for the project including Class III archaeological surveys and tribal surveys to identify properties of religious and cultural significance." Final PA at 3 (Attachment 9). As discussed, this assertion is demonstrably false, as the ASLB subsequently found that NRC Staff had objectively failed to conduct any competent "surveys to identify properties of religious and cultural significance." As such, the PA is not a lawful basis for BLM to establish NHPA compliance with regard to FLPMA duties and responsibilities involving federal public lands.

In addition to the Section 106 NHPA duties, NHPA Section 110 imposes responsibilities on BLM to ensure a proper identification and evaluation of cultural resources. These duties cannot be dispensed with simply through attempts to contact the Tribe in the Section 106 consultation context. Further, NEPA imposes a separate but closely related set of duties on federal agencies when addressing cultural resources. NRC has found the EIS inadequate to meet NEPA's statutory mandates, and BLM has made no serious effort to address these deficiencies – rendering BLM's analysis legally deficient with respect to a cultural resource impacts analysis. While NRC Staff is currently attempting to escape its NEPA responsibilities – arguing that the cultural resources information is "unavailable", the Tribe vigorously contests this argument. In any case, BLM may not rely on such arguments as NRC's position in this regard is highly specific to its own administrative process, timing, and financial constraints.

ATTACHMENT 1

Azarga URANIUM

Source: *Azarga Uranium Corp.*

October 31, 2017 16:30 ET

Azarga Uranium Data Analysis Identifies Uranium Mineralization at Dewey Terrace

GREENWOOD VILLAGE, COLORADO--(Marketwired - Oct. 31, 2017) - AZARGA URANIUM CORP. (TSX:AZZ)(FRANKFURT:P8AA)(OTC PINK:PWURF) ("Azarga Uranium" or the "Company") has identified uranium mineralization at the Company's Dewey Terrace Project through the analysis of historical data owned by the Company (the "Data Set"). The Dewey Terrace Project is located in Wyoming, adjacent to the Company's NRC licensed Dewey Burdock in-situ recovery uranium Project (the "Dewey Burdock Project").

Highlights of the analysis at Dewey Terrace include:

- 91 mineralized drill holes with 129 intercepts equal to or exceeding a 0.2 grade-thickness (GT) cutoff using a .02% grade cutoff with an average eU_3O_8 grade of 0.062% and an average thickness of 7.4 feet
- Uranium mineralization covering seven (7) separate mineralized zones over a trend of approximately 2.5 miles
- Mineralization within the same ore bearing sandstone as the Dewey Burdock Project and conditions that indicate possible in-situ recovery ("ISR") amenability

"We are very pleased to see that our initial analysis indicates uranium resource potential at the Dewey Terrace Project. The Data Set confirms that within the same Inyan Kara sands as the Dewey Burdock Project, uranium mineralization, potentially suitable for ISR, exists. This uranium mineralization indicates possibilities for further discoveries in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects. We believe that further analysis of the Data Set will allow expansion of our uranium resources and the location of the identified uranium mineralization at the Dewey Terrace Project presents an opportunity for a nearby satellite project, within 10 miles of the Dewey Burdock Project, the Company's initial development priority," said John Mays, Chief Operating Officer.

The Data Set identified 259 mineralized drill holes indicating significant potential for a new resource area at the Dewey Terrace Project. Further, deposition is consistent with sand channel systems categorized within the Dewey Burdock Project. Several drill holes encountered multiple intercepts demonstrating a vertically stacked group of separate mineralized zones similar to those at the Dewey Burdock Project. The objective of the Data Set analysis is to identify uranium mineralization in a cost effective manner in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects. The Company is continuing its review of the Data Set for further uranium mineralization with the objective of identifying additional uranium resources.

The following table provides a detailed summary of the results for the 91 mineralized drill holes with 129 intercepts that equal or exceed a 0.2 GT cutoff using a .02% grade cutoff:

Hole ID	Zone	Depth (ft)	Thickness (ft)	Avg. GT	Avg. Grade (%)
DEX 033	LE	649.5	6.3	0.21	0.034
DEX 035	UD	627.0	9.5	0.39	0.041
DEX 039	LE	650.0	10.5	0.47	0.045
DEX 052	LD	640.0	1.2	0.50	0.417
DEX 075	UD	602.3	4.0	0.26	0.066
DEX 097	C	586.5	12.0	0.31	0.026
DEX 101	C	589.0	2.0	0.23	0.114
DEX 113	UE	622.0	3.2	0.21	0.065
DEX 113	UD	590.5	2.9	0.32	0.112
DEX 116	LE	642.0	5.0	0.33	0.067
DEX 125	C	585.0	6.1	0.21	0.035
DEX 133	LE	638.8	3.7	0.24	0.064
DEX 144	UD	604.3	3.5	0.27	0.076
DEX 144	LD	613.0	8.2	0.49	0.060
DEX 168	LE	632.3	2.7	0.25	0.092
DEX 172	UD	599.5	6.3	0.22	0.035
DEX 175	UE	626.1	2.7	0.24	0.089
DEX 200	LD	718.2	10.9	0.29	0.026
DEX 204	UD	665.8	11.0	0.25	0.023
DEX 220	C	578.0	3.1	0.25	0.080
DEX 220	UE	624.4	5.8	0.61	0.105
DEX 230	LE	650.3	1.5	0.26	0.170
DEX 231	UD	594.0	5.0	0.94	0.187
DEX 233	UE	617.5	5.5	0.31	0.056
DEX 237	UE	638.5	3.8	0.20	0.053
DEX 237	C	604.7	6.3	0.30	0.048
DEX 240	LE	628.0	9.0	0.90	0.100
DEX 241	C	594.0	7.2	0.28	0.039
DEX 245	LD	615.0	6.3	0.24	0.038
DEX 245	UD	599.9	9.7	0.45	0.046
DEX 245	C	581.9	12.6	0.52	0.041
DEX 251	UE	677.0	4.0	0.22	0.055
DEX 260	LD	663.5	9.5	0.24	0.026
DEX 263	LE	641.5	8.5	0.26	0.030
DEX 264	LD	620.8	6.9	0.24	0.035
DEX 268	LE	620.2	8.1	0.21	0.025
DEX 268	UE	608.5	10.1	0.41	0.041
DEX 272	UD	588.5	3.5	0.23	0.067
DEX 275	UE	619.9	5.4	0.35	0.064
DEX 275	UD	589.7	4.0	0.36	0.089
DEX 275	LD	604.5	8.0	0.36	0.045
DEX 278	UD	592.0	4.8	0.32	0.067

DEX 278	LE	634.3	4.3	0.34	0.078
DEX 283	C	582.1	6.0	0.24	0.039
DEX 284	UD	596.0	11.3	0.56	0.049
DEX 288	UE	616.6	7.4	0.21	0.029
DEX 288	LD	607.0	4.5	0.35	0.077
DEX 288	UD	595.1	8.2	0.40	0.049
DEX 288	C	579.5	7.9	0.47	0.060
DEX 289	UE	619.0	7.5	0.75	0.099
DEX 291	UE	634.9	6.1	0.39	0.065
DEX 292	LD	620.0	6.7	0.34	0.050
DEX 292	UE	634.0	10.6	0.38	0.036
DEX 297	LE	631.2	4.3	0.22	0.051
DEX 297	UE	617.0	9.3	0.47	0.051
DEX 308	LE	675.0	7.5	0.51	0.068
DEX 309	LD	619.0	6.8	0.21	0.031
DEX 326	LD	632.0	9.4	0.39	0.041
DEX 326	UD	622.0	6.0	0.56	0.094
DEX 327	LD	620.0	8.0	0.22	0.027
DEX 328	UE	625.5	11.5	0.47	0.041
DEX 338	C	591.8	2.7	0.33	0.123
DEX 339	C	591.5	6.6	0.41	0.062
DEX 340	LD	630.0	3.8	0.23	0.061
DEX 340	UD	618.3	7.0	0.28	0.040
DEX 341	C	590.0	4.6	0.32	0.068
DEX 344	UD	608.0	8.2	0.38	0.047
DEX 344	LD	619.5	9.5	0.43	0.046
DEX 348	UD	618.5	3.2	0.20	0.064
DEX 362	UE	618.3	12.9	0.41	0.032
DEX 362	UD	595.0	19.5	0.45	0.023
DEX 374	LE	631.3	7.5	0.23	0.030
DEX 375	LD	603.8	10.2	0.22	0.022
DEX 378	UD	616.0	9.0	0.41	0.045
DEX 378	LD	625.0	10.5	0.47	0.045
DEX 384	C	582.3	6.9	0.29	0.042
DEX 386	C	598.5	7.0	0.27	0.039
DEX 387	LD	632.3	7.8	0.84	0.107
DEX 388	UD	591.0	14.0	0.66	0.047
DEX 391	UD	584.5	6.0	0.22	0.036
DEX 392	LD	627.0	9.3	0.25	0.027
DEX 392	C	591.0	10.5	0.38	0.036
DEX 392	UD	611.1	4.0	0.70	0.175
DEX 393	UD	609.0	2.7	0.46	0.170
DEX 393	C	598.3	2.3	0.50	0.219

DEX 393	LD	618.8	11.0	0.79	0.072
DEX 397	C	578.1	9.5	0.23	0.024
DEX 398	C	578.0	9.3	0.21	0.023
DEX 398	UD	593.7	6.7	0.47	0.070
DEX 398	LD	610.5	8.1	0.55	0.069
DEX 403	LD	613.5	11.3	0.35	0.031
DEX 403	C	588.9	12.6	0.36	0.029
DEX 404	UB	562.0	15.3	0.38	0.025
DEX 417	C	583.3	11.6	0.45	0.038
DEX 417	LD	611.2	10.8	0.59	0.055
DEX 418	LD	619.0	4.9	0.28	0.057
DEX 426	LD	595.0	10.6	0.32	0.030
DEX 426	UD	583.5	2.4	0.38	0.158
DEX 431	UE	614.0	5.2	0.28	0.054
DEX 432	UD	594.1	9.8	0.36	0.037
DEX 441	C	571.0	9.3	0.25	0.027
DEX 441	UD	587.0	15.6	1.01	0.065
DEX 442	UE	618.3	6.1	0.33	0.055
DEX 442	LD	602.5	12.8	0.48	0.038
DEX 451	LD	609.0	4.9	0.34	0.070
DEX 451	UD	600.0	6.3	0.45	0.071
DEX 456C	LD	632.0	9.8	1.07	0.110
DEX 458	LD	614.1	5.1	0.26	0.051
DEX 458	UD	600.1	8.8	0.34	0.038
DEX 459	UD	584.9	12.2	0.38	0.031
DEX 460	UD	593.3	9.0	0.30	0.033
DEX 462	LD	589.5	4.5	0.26	0.057
DEX 462	UD	575.2	6.5	0.31	0.047
DEX 463	UD	592.0	5.3	0.22	0.042
DEX 463	LD	603.3	5.7	0.31	0.054
DEX 464	UD	593.2	5.8	0.24	0.041
DEX 464	C	584.0	6.7	0.27	0.040
DEX 469	UD	582.1	5.0	0.37	0.074
DEX 471	UE	598.3	13.2	0.70	0.053
DEX 473	UD	576.0	3.2	0.20	0.063
DEX 474	C	585.0	3.1	0.23	0.076
DEX 474	LD	610.2	5.0	0.37	0.074
DEX 475	UD	581.5	8.9	0.24	0.026
DEX 479	UD	582.0	11.8	0.35	0.030
DEX 479	LD	599.5	4.6	0.42	0.091
DEX 482	LD	585.9	6.4	0.42	0.065
DEX 483	C	565.0	10.9	0.54	0.050
ST 23	FR	492.0	13.5	0.38	0.028

TER 07-11	UD	599.0	5.5	0.26	0.047

The Company also identified 93 drill holes with 112 intercepts that had GT values ranging from 0.1 to 0.2 GT based on review of the Data Set. These intercepts had an average thickness of 4.1 feet with an average grade of 0.041% eU3O8. The remaining 187 drill holes reviewed to date range from barren to an average GT of 0.1.

The technical information in this news release has been prepared in accordance with the Canadian regulatory requirements set out in National Instrument 43-101 ("NI 43-101") and was reviewed by John Mays, P.E., Chief Operating Officer for the Company and a Qualified Person under NI 43-101.

The Data Set includes historical drilling information that has been reviewed by the Company's geological team, as well as 20 exploratory drill holes completed by the Company in a previous exploration campaign. The exploratory drill holes completed by the Company confirm the presence of uranium mineralization at the Dewey Terrace Project. The Company's review of the records and information within the Data Set reasonably substantiate the validity of this information; however, the Company cannot directly verify the accuracy of the historical data, including the procedures used for sample collection and analysis. Therefore, the Company encourages investors not to place undue weight on these results.

About Azarga Uranium Corp.

Azarga Uranium is an integrated uranium exploration and development company that controls six uranium projects, deposits and prospects in the United States of America (South Dakota, Wyoming and Colorado) and the Kyrgyz Republic. The Dewey Burdock in-situ recovery uranium project in South Dakota (the "Dewey Burdock Project"), which is the Company's initial development priority, has received its Nuclear Regulatory Commission License and draft Class III and Class V Underground Injection Control ("UIC") permits from the Environmental Protection Agency ("EPA") and the Company is in the process of completing other major regulatory permit approvals necessary for the construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA.

For more information please visit www.azargauranium.com.

Follow us on Twitter at @AzargaUranium.

Disclaimer for Forward-Looking Information

Certain statements in this news release are forward-looking statements, which reflect the expectations of management regarding its disclosure and amendments thereto. Forward-looking statements consist of statements that are not purely historical, including any statements regarding beliefs, plans, expectations or intentions regarding the future. Such statements may include, but are not limited to, statements with respect to the Company's continued efforts to obtain all major regulatory permit approvals necessary for the construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA, the Company's belief that mineralization conditions at the Dewey Terrace Project indicate possible ISR amenability, that the Company's initial analysis indicates uranium resource potential at the Dewey Terrace Project, that uranium mineralization identified in the Data Set indicates possibilities for further discoveries in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, the Company's belief that further analysis of the Data Set will allow expansion of our uranium resources and the location of the identified uranium mineralization at the Dewey Terrace Project presents an opportunity for a nearby satellite project, that the identified mineralization from the Data Set indicates significant potential for a new resource area at the Dewey Terrace Project, that the objective of the Data Set analysis is

to identify uranium mineralization in a cost effective manner in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects and that the Company's is continuing its review of the Data Set for further uranium mineralization with the objective of identifying additional uranium resources. Such statements are subject to risks and uncertainties that may cause actual results, performance or developments to differ materially from those contained in the statements. No assurance can be given that any of the events anticipated by the forward-looking statements will occur or, if they do occur, what benefits the Company will obtain from them.

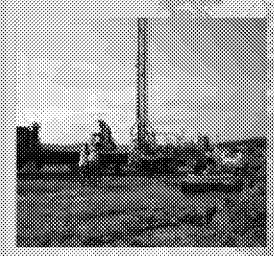
These forward-looking statements reflect management's current views and are based on certain expectations, estimates and assumptions, which may prove to be incorrect. A number of risks and uncertainties could cause our actual results to differ materially from those expressed or implied by the forward-looking statements, including without limitation: (1) the risk that the Company does not obtain all major regulatory permit approvals necessary for construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA, (2) the risk that mineralization conditions at the Dewey Terrace Project are not amenable to ISR, (3) the risk that the Company's initial analysis indicating uranium resource potential at the Dewey Terrace Project is not correct, (4) the risk that uranium mineralization identified in the Data Set does not indicate possibilities for further discoveries in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, (5) the risk that further analysis of the Data Set does not allow expansion of the Company's uranium resources and the location of the identified uranium mineralization at the Dewey Terrace Project does not present an opportunity for a nearby satellite project, (6) the risk that the identified mineralization from the Data Set does not indicate significant potential for a new resource area at the Dewey Terrace Project, (7) the risk that the Data Set analysis does not identify uranium mineralization in a cost effective manner in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, (8) the risk that the Company's review of the Data Set does not identify further uranium mineralization and additional uranium resources are not identified, (9) the risk that such statements may prove to be inaccurate and (10) other factors beyond the Company's control. These forward-looking statements are made as of the date of this news release and, except as required by applicable securities laws, the Company assumes no obligation to update these forward-looking statements, or to update the reasons why actual results differed from those projected in the forward-looking statements. Additional information about these and other assumptions, risks and uncertainties are set out in the "Risks and Uncertainties" section in the Company's most recent MD&A filed with Canadian security regulators.

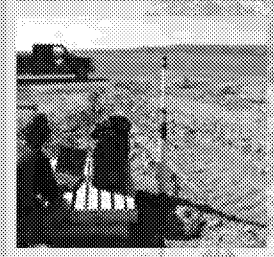
The TSX has not reviewed and does not accept responsibility for the adequacy or accuracy of the content of this News Release.

Contact Information:

Azarga Uranium Corp.
John Mays
COO
+1 303 790-7528
info@azargauranium.com
www.azargauranium.com

ATTACHMENT 2




POWERTECH (USA) INC.

Dewey-Burdock Project
Application for NRC Uranium Recovery License
Fall River and Custer Counties, South Dakota
Technical Report

February 2009

Prepared for

U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Prepared by

Powertech (USA) Inc.
5575 DTC Parkway, Suite #140
Greenwood Village, CO 80111
Phone: 303-790-7528
Facsimile: 303-790-3885

1.8 Operating Plans, Design Throughput, and Production

The Proposed Action will utilize uranium ISL production facilities at both the Dewey and Burdock sites with a CPP located at the Burdock site. The IX process and well fields are designed for a nominal flow rate of 2000 gpm at each site. Total production from both sites is expected to produce approximately 1,000,000 pounds of U_3O_8 per year.

1.9 Project Schedule

Following the issuance of an NRC uranium recovery license and other relevant permits it is anticipated that construction of the Burdock Well Field 1, CPP and ancillary facilities including storage ponds and land application pivots will commence. The construction of the Dewey Well Field 1 and ancillary facilities will follow shortly thereafter. Startup of the Dewey and Burdock operations will commence upon completion of construction and will continue for approximately 7 to 20 years or more during which additional well fields will be completed along the roll fronts at both Dewey and Burdock sites. It is planned that groundwater restoration can be accomplished within NRC requirements for timeliness in decommissioning (10 CFR § 40.42); however, in the event restoration cannot be accomplished within this timeframe, Powertech (USA) will seek NRC approval for an alternate schedule. The projected construction, operation, restoration and decommissioning schedule is provided in Figure 1.9-1.

Decommissioning of the well fields including well abandonment, the removal of piping, tanks, ancillary buildings and equipment, cleanup of surface soil to applicable standards and revegetation of disturbed areas will be implemented following the cessation of ISL operations at the Dewey and Burdock sites. It is likely that the CPP at the Burdock site will continue to operate for several years following the decommissioning of the Proposed Action well fields. The CPP may continue to process uranium from other ISL projects such as the nearby Powertech (USA) satellite ISL projects of Aladdin and Dewey Terrace planned in Wyoming, as well as possible tolling arrangements with other operators.

ATTACHMENT 3

OMB No. 2040-0042 Approval Expires 12/31/2011

United States Environmental Protection Agency

Underground Injection Control Permit Application

(Collected under the authority of the Safe Drinking Water Act, Sections 1421, 1422, 40 CFR 144)

I. EPA ID Number

	T/A	C
U		

Read Attached Instructions Before Starting

For Official Use Only

Application approved mo day year	Date received mo day year	Permit Number	Well ID	FINDS Number

II. Owner Name and Address

Owner Name: Powertech (USA) Inc.

Street Address: 5575 DTC Parkway, Suite 140

Phone Number: (303) 790-7528

City: Greenwood Village

State: CO

ZIP CODE: 80111

III. Operator Name and Address

Owner Name: Powertech (USA) Inc.

Street Address: 5575 DTC Parkway, Suite 140

Phone Number: (303) 790-7528

City: Greenwood Village

State: CO

ZIP CODE: 80111

IV. Commercial Facility

[ ] Yes
[x] No

V. Ownership

[x] Private
[ ] Federal
[ ] Other

VI. Legal Contact

[x] Owner
[ ] Operator

VII. SIC Codes

SIC: 1094
NAISC: 212291

VIII. Well Status *(Mark "x")*

[ ] A. Operating — Date Started mo day year:

[ ] B. Modification/Conversion

[x] C. Proposed

IX. Type of Permit Requested *(Mark "x" and specify if required)*

[ ] A. Individual [x] B. Area

Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
0	Up to 4,000	Dewey-Burdock

X. Class and Type of Well *(see reverse)*

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
III	U		Up to 4,000

XI. Location of Well(s) or Approximate Center of Field or Project

Latitude Deg	Min	Sec	Longitude Deg	Min	Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line
103	59	43	43	28	55	34	6S	1E	SW	93	W	1403	S

XII. Indian Lands [ ] Yes [x] No

XIII. Attachments

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

XIV. Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title *(Type or Print)*: Richard Blubaugh, Vice President Environmental Health & Safety Resources

B. Phone No. *(Area Code and No.)*: (303) 790-7528

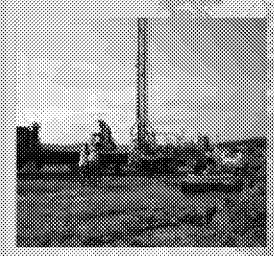
C. Signature: Richard Blubaugh

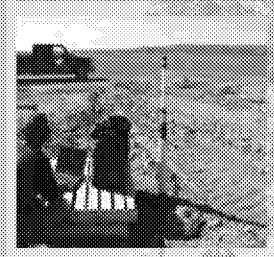
D. Date Signed: 8/1/2012

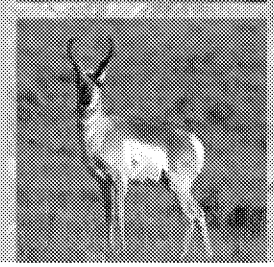
EPA Form 7520-6 (Rev. 12-08)

Following regulatory approval of successful aquifer restoration, each well field will be decommissioned. It is likely that the CPP will continue to operate for several years following decommissioning of the well fields. The CPP may continue to process uranium-loaded ion exchange resin from other ISR projects such as the nearby Powertech Aladdin and Dewey Terrace ISR projects planned in Wyoming, as well as possible tolling arrangements with other operators. The entire Dewey-Burdock Project will then be decommissioned and reclaimed in accordance with NRC, EPA, BLM and DENR requirements. The projected construction, operation, restoration and decommissioning schedule is provided in Figure 10.2.

ATTACHMENT 4







POWERTECH (USA) INC.

Dewey-Burdock Project
Application for NRC Uranium Recovery License
Fall River and Custer Counties, South Dakota
Environmental Report

February 2009

Prepared for

U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Prepared by

Powertech (USA) Inc.
5575 DTC Parkway, Suite #140
Greenwood Village, CO 80111
Phone: 303-790-7528
Facsimile: 303-790-3885

Dewey and Burdock sites. The projected schedule for construction, operation, and decommissioning (including restoration) is provided in Figure 1.3-1.

In each well field, production activities will proceed until such time as the uranium concentration in the pregnant solution has declined to an uneconomic recovery level. After production ceases, Powertech (USA) will be restoring the groundwater consistent with baseline and in accordance with 10 CFR Part 40 Appendix A, Criterion 5(b)(5). Reclamation of surface disturbances will occur after completion of restoration activities in a well field and will continue the same manner after additional well fields are developed, produced and restored. Therefore, at any time there may be well fields in three different stages of the process: wellfields in production, well fields undergoing groundwater restoration, and well fields undergoing surface reclamation. Additionally, there also may be some small areas indirectly related to these process phases that are held unreclaimed for short periods of time (e.g., storage of top soil). This proposed operational and reclamation plan ensures minimal potential environmental impacts.

D&D of the well fields includes well abandonment, the removal of piping, tanks, ancillary buildings and equipment, cleanup of surface soil to radiological standards in 10 CFR Part 40, Appendix A, Criterion 6 and revegetation of disturbed areas. It is likely that the CPP at the Burdock site will continue to operate for several years following the D&D of the project well fields. The Proposed Action is for the plant to continue to receive and process uranium loaded resins from other Proposed Projects such as Powertech's nearby Aladdin and Dewey Terrace Proposed Satellite Facility Projects planned in Wyoming or from other licensed ISL operators or other licensed facilities generating uranium-loaded resins that are compatible with the Powertech (USA) production process.

ATTACHMENT 5

ORDER / CASE NO:	**ORDER NO. 5-2019**
ORDER / NOTICE OF RECOMMENDATION TYPE:	**EXCEPTION LOCATION**
COUNTY:	**FALL RIVER**
LOCATION(S):	**T. 8S., R. 1E., SEC. 7**
OPERATOR:	**T-C OIL COMPANY, LLC**
DATE ORDER ISSUED:	**07/09/2019**
DATE ORDER CLOSED:	
AMENDS:	
AMENDED BY:	
APPROVAL STATUS:	
FIELD NAME:	
UNIT NAME:	

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

July 9, 2019

Gerald Freidrichs
Drilling Supervisor
T-C Oil Company, LLC
427 FM 774
Refugio, TX 78377

Dear Mr. Freidrichs:

Thank you for your application filed May 28, 2019, requesting approval to drill an oil well at a location that is an exception to statewide spacing. The well is located 513 feet from the east line and 261 feet from the north line in Section 7, Township 8 South, Range 1 East, approximately 11.9 miles northwest of Edgemont, Fall River County, SD.

The department published a Notice of Recommendation, Oil and Gas Case No. 5-2019, recommending approval of the application. The date for intervention was July 3, 2019, and no parties petitioned the Board of Minerals and Environment for a hearing on the application by the deadline.

Therefore, in accordance with the Administrative Rules of South Dakota 74:12:02:08 and 74:12:02:09, approval of the application is hereby granted. Enclosed is the Notice of Recommendation.

If our office can be of further assistance to you, please do not hesitate to contact me at (605) 773-4201.

Sincerely,

Mike Lees, Administrator
Minerals and Mining Program

Enclosure

cy/w enc: Joe Rochelle, P.E., Engineer for T-C Oil Company, LLC, Allen & Crouch Petroleum Engineers, P. O. Box 976, Casper,WY 82601

STATE OF SOUTH DAKOTA
SECRETARY OF THE
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF T-C OIL COMPANY, LLC, REFUGIO, TX, FOR A PERMIT TO DRILL AN OIL AND GAS WELL AT AN EXCEPTION LOCATION TO STATEWIDE SPACING, DESCRIBED AS THE SOUTH DAKOTA FEDERAL 7-1 WELL, LOCATED 261 FEET FROM THE NORTH LINE AND 513 FEET FROM THE EAST LINE IN SECTION 7, TOWNSHIP 8 SOUTH, RANGE 1 EAST; APPROXIMATELY 11.9 MILES NORTHWEST OF EDGEMONT, FALL RIVER COUNTY, SD.	NOTICE OF RECOMMENDATION OIL AND GAS CASE NO. 5-2019

Notice is hereby given to the public and to all interested persons that pursuant to South Dakota Codified Laws (SDCL) Chapter 1-26 and Chapter 45-9 and further pursuant to the Administrative Rules of South Dakota (ARSD) 74:12:02:08 and 74:12:09, the following matter has come to the attention of the Secretary of the Department of Environment and Natural Resources, hereinafter "Secretary."

The Secretary recommends approval of the exception location for the following reasons:

1. The applicant asserts that drilling this well at the location prescribed by the statewide spacing rule would likely result in a well unable to produce in economic quantities, as indicated by three dimensional seismic interpretation.

2. No other producing or drilled oil and gas wells are located within 1,000 feet of the proposed location.

Authority for the Secretary to approve this application is contained in ARSD 74:12:02:08 and 74:12:09. Unless a person files a petition requesting a hearing on the above application pursuant to the provisions of ARSD 74:09:01 on or before July 3, 2019, the Secretary's recommendation will be considered final and the Secretary will approve the application in accordance with that recommendation.

The application and notice of recommendation are also posted on the department's website at: http://denr.sd.gov/des/og/pubhearing.aspx and http://denr.sd.gov/public. Additional information about this application is available from Mike Lees, Administrator, Minerals and Mining Program, Department of Environment and Natural Resources, 523 East Capitol Avenue, Pierre, SD 57501, telephone (605) 773-4201, email michael.lees@state.sd.us.

June 7, 2019

Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.

ALLEN & CROUCH
PETROLEUM ENGINEERS

RECEIVED
JUL 01 2019
MINERALS & MINING PROGRAM

June 26, 2019

Re: Reply to Letter Dated June 7, 2019 Notice of Recommendation
T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377
South Dakota Federal 7-1 (Confidential)
261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

Department of Environment and Natural Resources Attention: Miles Lee
Joe Foss Building 523 East Capitol
Pierre, South Dakota 57501

Dear Mr. Lee:

This letter is a response to the South Dakota Department of Environment & Natural Resources letter dated June 7, 2019 for the South Dakota Federal 7-1 exception request.

Please find attached:

1. Affidavit of Notification
2. Certified mail return receipts
3. A list of persons notified

All of the mineral property within one-half mile of the location is owned or has been leased by T-C Oil Company, LLC.

If you have any questions or need additional information, please call me at (307) 234-3571.

Sincerely,

Joe Rochelle

Joe Rochelle, PE
Engineer for T-C Oil Company, LLC

Attachments

Cc: Gerald Friedrichs T-C Oil Company

Allen & Crouch Petroleum Engineer 307.234.3571
646 River Cross Road, Casper, WY 82601 phone
PO Box 976, Casper, WY 8260 307.234.9865 fax

Re: Request for Location Exception
T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377
South Dakota Federal 7-1 (Confidential)
261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

AFFIDAVIT OF NOTIFICATION

STATE OF WYOMING)
) ss
COUNTY OF NATRONA)

The undersigned, Joe Rochelle, of lawful age, after having first duly sworn upon his oath, disposes and states:

- All of the lease operators or owners, all surface owners and royalty owners within a one-half (½) mile radius of the proposed South Dakota Federal 7-1 are listed on Exhibit L-1.

- Notifications of the application were mailed by certified mail, return receipt requested, to all of the lease operators or owners and all surface owners listed on Exhibit L-1, by depositing same in the same in the United States mail on the 26th Day of June, 2019.

By: Joe Rochelle
Joe Rochelle

for T-C Oil Company, LLC

STATE OF WYOMING)
) ss
COUNTY OF NATRONA)

The foregoing instrument was subscribed and sworn to before me this 26th day of June 2019.

Witness my hand and official seal.

Notary Public

My Commission Expires:

MARCH 24, 2022

NOTARY PUBLIC
AMY SALE
STATE OF WYOMING
COUNTY OF NATRONA
My Commission Expires Mar 24, 2022

Exhibit L-1

List of Surface Owners, Lease Operators, Mineral Owners within ½ mile radius of the South Dakota Federal 7-1 NE NE Section 7-T8S-R1E, Fall River County, South Dakota.

Name and Address	Type of Interest
T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377	Lease Owner
Nebraska National Forest and Grasslands 1801 Highway 18 Bypass Hot Springs, SD 57747	Surface Owner
Bureau of Land Management North Dakota Field Office 99 23rd Ave., Suite A Dickinson, ND 58601	Mineral Owner
Bureau of Land Management South Dakota Field Office 310 Roundup Street Belle Fourche, SD 57717	Mineral Owner

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- Return Receipt (electronic) $0.00
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- Adult Signature Required $0.00
- Adult Signature Restricted Delivery $

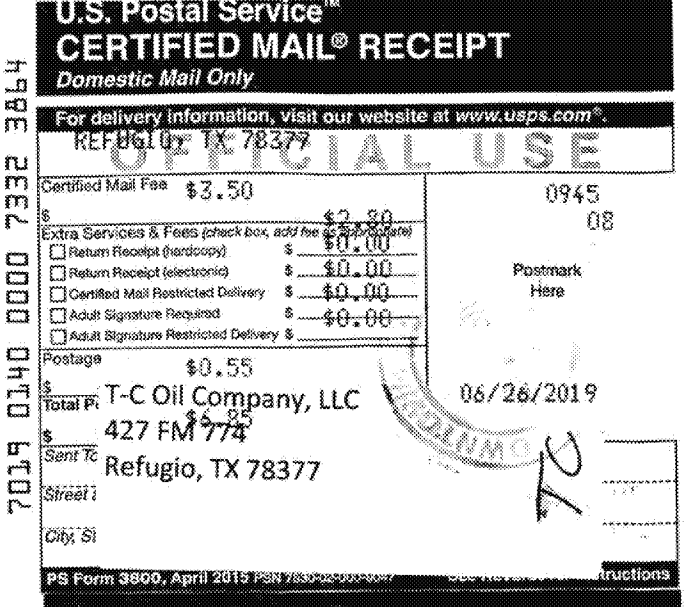
Postage $0.55
Total Postage and Fees $6.85

Postmark Here
0945 08
06/26/2019

Sent To BLM
North Dakota Field Office
Street and 99 23rd Ave., Suite A
City, State Dickinson, ND 58601

PS Form

7019 0140 0000 7332 3857



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REFUGIO, TX 78377

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Certified Mail Fee $3.50
Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $0.00
- Return Receipt (electronic) $0.00
- Certified Mail Restricted Delivery $0.00
- Adult Signature Required $0.00
- Adult Signature Restricted Delivery $

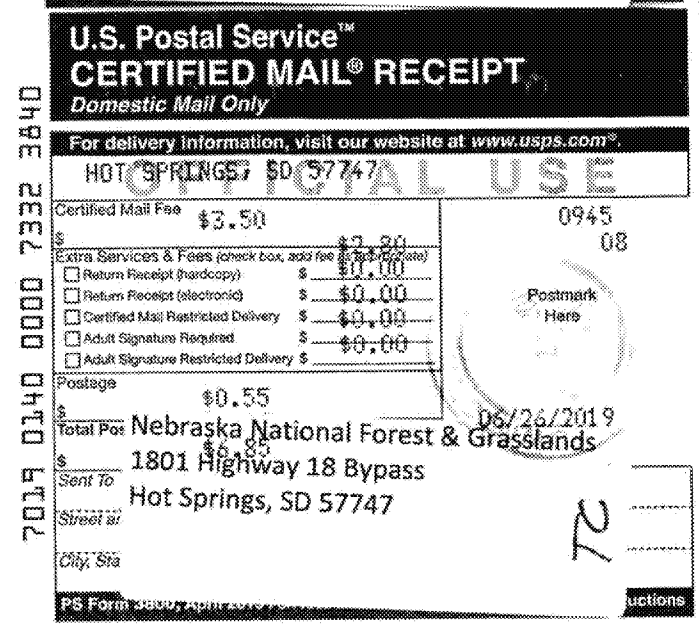
Postage $0.55
Total Postage and Fees $6.85

Postmark Here
0945 08
06/26/2019

Sent To T-C Oil Company, LLC
427 FM 774
Street and Refugio, TX 78377
City, State

PS Form 3800, April 2015

7019 0140 0000 7332 3864



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HOT SPRINGS, SD 57747

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- Return Receipt (electronic) $0.00
- Certified Mail Restricted Delivery $0.00
- Adult Signature Required $0.00
- Adult Signature Restricted Delivery $

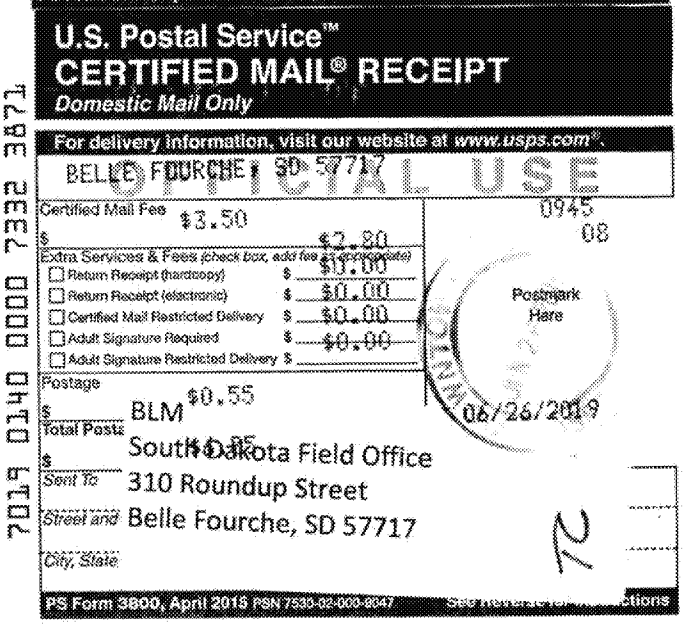
Postage $0.55
Total Postage and Fees $6.85

Postmark Here
0945 08
06/26/2019

Sent To Nebraska National Forest & Grasslands
1801 Highway 18 Bypass
Street and Hot Springs, SD 57747
City, State

PS Form

7019 0140 0000 7332 3840



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BELLE FOURCHE, SD 57717

OFFICIAL USE

Certified Mail Fee $3.50
Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $0.00
- Return Receipt (electronic) $0.00
- Certified Mail Restricted Delivery $0.00
- Adult Signature Required $0.00
- Adult Signature Restricted Delivery $

Postage $0.55
Total Postage and Fees $6.85

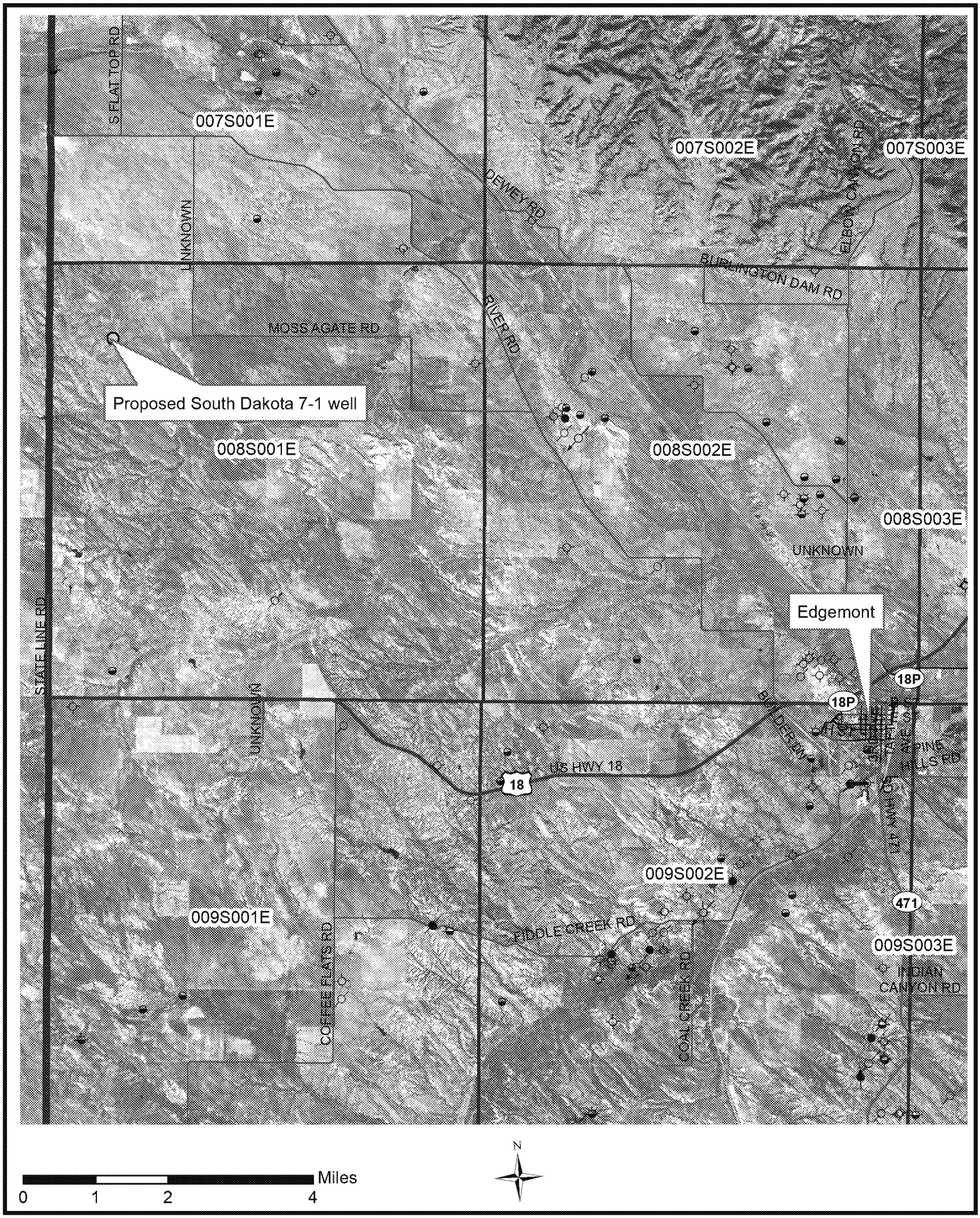
Postmark Here
0945 08
06/26/2019

Sent To BLM
South Dakota Field Office
310 Roundup Street
Street and Belle Fourche, SD 57717
City, State

PS Form 3800, April 2015

7019 0140 0000 7332 3871

South Dakota 7-1 Locator Map, T-C Oil



DENR

Affidavit of Publication

State of South Dakota
County of Fall River

Taylor Risse, being, first duly sworn, on oath, says: That he/she is an employee of Scherer Publishing, LLC, and that the Fall River County Herald is, and during all the times hereinafter mentioned was, a weekly legal newspaper as defined in the SDCL 17-2-2.1 through the 17-2-2.4 inclusive; that said newspaper has been published within the said county of Fall River and State of South Dakota, for at least one year next prior to the first publication of the attached public notice, and that the printed copy of which, taken from the paper in which the same was published, and which is hereto attached and made a part of this affidavit, was published in said newspaper for **1** successive week(s) to wit:

June 13, 2019

That the full amount of the fee charged for the publication of the attached public notice, **$31.74** insures to the sole benefit of the publisher or publishers; that no agreement or understanding for the division thereof has been made with any other person, and that no part thereof has been agreed to be paid to any person whomsoever; that the fees charged for the publication thereof are:

Signed: Taylor Risse

Subscribed and sworn to before me this 13 day of June, 2019.

Mandy K. Scherer
Notary Public

MANDY K. SCHERER NOTARY PUBLIC SEAL STATE OF SOUTH DAKOTA

My Commission Expires
December 9, 2021

Notice of Vacancy

Proceedings

Proceedings

Notice of Recommendation

2019 WORLD STANDINGS

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

June 7, 2019

Gerald Freidrichs
Drilling Supervisor
T-C Oil Company, LLC
427 FM 774
Refugio, TX 78377

Dear Mr. Freidrichs:

Enclosed is a copy of the Notice of Recommendation for T-C Oil Company, LLC, Refugio, TX - Oil and Gas Case No. 5-2019, Fall River County, SD. The Notice of Recommendation has been sent to the Fall River County Herald for publication on Thursday, June 13, 2019.

The purpose of this letter is to advise you that it is the applicant's responsibility to serve notice on those persons "....whose property may be affected..." as specified in South Dakota Codified Laws 45-9-58.

Please file with this office the following:

1. Affidavit of Notification
2. Certified mail return receipts
3. A list of persons notified

The department recommends T-C Oil Company complete its notification, and submits the affidavit of notification and the list of persons notified prior to the end of the notification period specified in the enclosed notice of recommendation.

Thank you for your cooperation.

Sincerely,

Mike Lees, Administrator
Minerals and Mining Program

Enclosure

cy/w enc: Joe Rochelle, P.E., Engineer for T-C Oil Company, LLC, Allen & Crouch Petroleum Engineers, P. O. Box 976, Casper, WY 82601

ALLEN & CROUCH
PETROLEUM ENGINEERS

RECEIVED
JUN 5 2019
DEPT OF ENVIRONMENT & NATURAL RESOURCES - RAPID CITY

June 5, 2019

Re: Request for Location Exception
T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377
South Dakota Federal 7-1 (Confidential)
261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

Minerals and Mining Program Attention: Lucy Dahl
2050 West Main Street, Suite #1
Rapid City, SD 57702-2493

Dear Ms. Dahl:

Pursuant to the rules and regulations of the South Dakota Department of Environment & Natural Resources, T-C Oil Company, LLC Company hereby requests administrative approval for a location exception for the referenced wellbore. The reason for the exception is due to the geology and structural conditions for optimizing the location. T-C Oil Company has run extensive seismic across this area. If the location is not moved, we will miss our planned target. As a consequence, the South Dakota Federal 7-1 was moved to an acceptable surface location.

All of the mineral property within one-half mile of the location is owned or has been leased by T-C Oil Company, LLC. The legal survey plat and a map showing the location is attached.

If no objections are received, and if the supervisor is of the opinion that a hearing is unnecessary, please administratively approve this application. If you have any questions or need additional information, please call me at (307) 234-3571.

Sincerely,

Joe Rochelle

Joe Rochelle, PE
Engineer for T-C Oil Company, LLC

Attachments

Cc: Gerald Freidrichs T-C Oil Company

Allen & Crouch Petroleum Engineer 307.234.3571
646 River Cross Road, Casper, WY 82601 phone
PO Box 976, Casper, WY 8260 307.234.9865 fax

STATE OF SOUTH DAKOTA
SECRETARY OF THE
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF T-C OIL COMPANY, LLC, REFUGIO, TX, FOR A PERMIT TO DRILL AN OIL AND GAS WELL AT AN EXCEPTION LOCATION TO STATEWIDE SPACING, DESCRIBED AS THE SOUTH DAKOTA FEDERAL 7-1 WELL, LOCATED 261 FEET FROM THE NORTH LINE AND 513 FEET FROM THE EAST LINE IN SECTION 7, TOWNSHIP 8 SOUTH, RANGE 1 EAST; APPROXIMATELY 11.9 MILES NORTHWEST OF EDGEMONT, FALL RIVER COUNTY, SD.	NOTICE OF RECOMMENDATION OIL AND GAS CASE NO. 5-2019

Notice is hereby given to the public and to all interested persons that pursuant to South Dakota Codified Laws (SDCL) Chapter 1-26 and Chapter 45-9 and further pursuant to the Administrative Rules of South Dakota (ARSD) 74:12:02:08 and 74:12:09, the following matter has come to the attention of the Secretary of the Department of Environment and Natural Resources, hereinafter "Secretary."

The Secretary recommends approval of the exception location for the following reasons:

1. The applicant asserts that drilling this well at the location prescribed by the statewide spacing rule would likely result in a well unable to produce in economic quantities, as indicated by three dimensional seismic interpretation.

2. No other producing or drilled oil and gas wells are located within 1,000 feet of the proposed location.

Authority for the Secretary to approve this application is contained in ARSD 74:12:02:08 and 74:12:09. Unless a person files a petition requesting a hearing on the above application pursuant to the provisions of ARSD 74:09:01 on or before July 3, 2019, the Secretary's recommendation will be considered final and the Secretary will approve the application in accordance with that recommendation.

The application and notice of recommendation are also posted on the department's website at: http://denr.sd.gov/des/og/pubhearing.aspx and http://denr.sd.gov/public. Additional information about this application is available from Mike Lees, Administrator, Minerals and Mining Program, Department of Environment and Natural Resources, 523 East Capitol Avenue, Pierre, SD 57501, telephone (605) 773-4201, email michael.lees@state.sd.us.

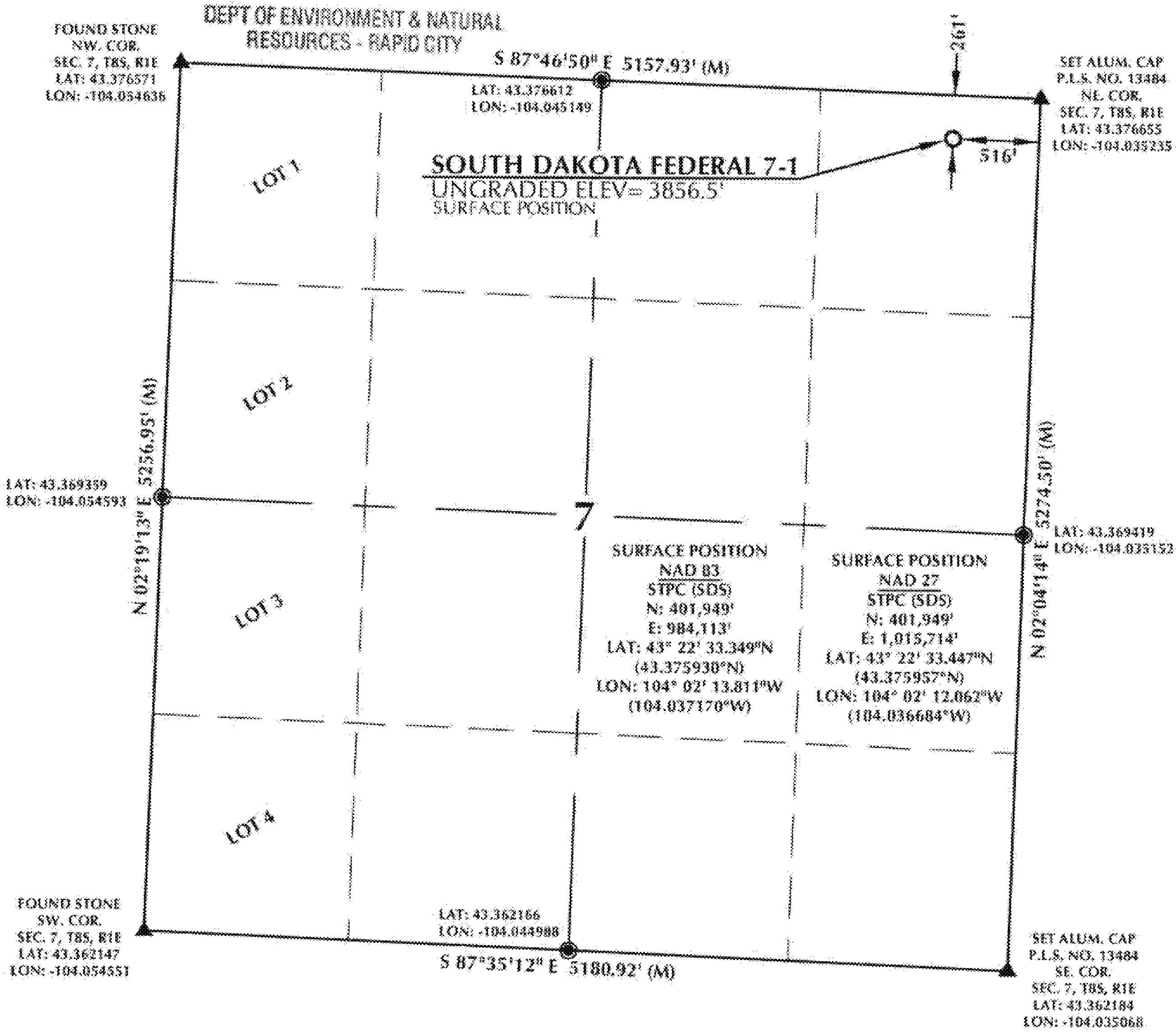
June 7, 2019

Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.

RECEIVED
MAY 2 8 2019
DEPT OF ENVIRONMENT & NATURAL RESOURCES - RAPID CITY

T8S, R1E



CERTIFICATE OF SURVEYOR

I, WRANGLER GROHS, A LICENSED PROFESSIONAL LAND SURVEYOR IN THE STATE OF SOUTH DAKOTA, DO HEREBY CERTIFY THAT THIS PLAT WAS [illegible] DURING AN ACTUAL SURVEY [illegible] NECESSARY LOCATIONS PERFORMED BY ME OR UNDER MY SUPERVISION AND THAT THE LOCATION AND LEGAL DESCRIPTION PRESENTED FROM THE SURFACE LOCATION ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

REGISTERED LAND SURVEYOR
REG NO
13484
WRANGLER J. GROHS
SOUTH DAKOTA

WRANGLER GROHS
PROFESSIONAL LAND SURVEYOR
SOUTH DAKOTA REGISTRATION NUMBER 13484
Date 4/24/19

N

0 1000' 2000'
HORIZONTAL
SCALE: 1" = 1000'

NOTES:

1. ▲ INDICATES SECTION CORNER.
2. ◉ INDICATES CALCULATED CORNER.
3. SECTION CORNER LATITUDES AND LONGITUDES ARE NAD83 (2011)(EPOCH:2010).
4. ELEVATION BASED ON NAVD88 (GEOID12B).
5. BASIS OF BEARING IS FROM SOUTH DAKOTA COORDINATE SYSTEM NAD83, SOUTH ZONE, U.S. SURVEY FEET.
6. ALL MEASURED DISTANCES ARE GRID. COMBINED SCALE FACTOR: .99972955 CALCULATED FROM THE NW. CORNER OF SECTION 7, T8S, R1E.

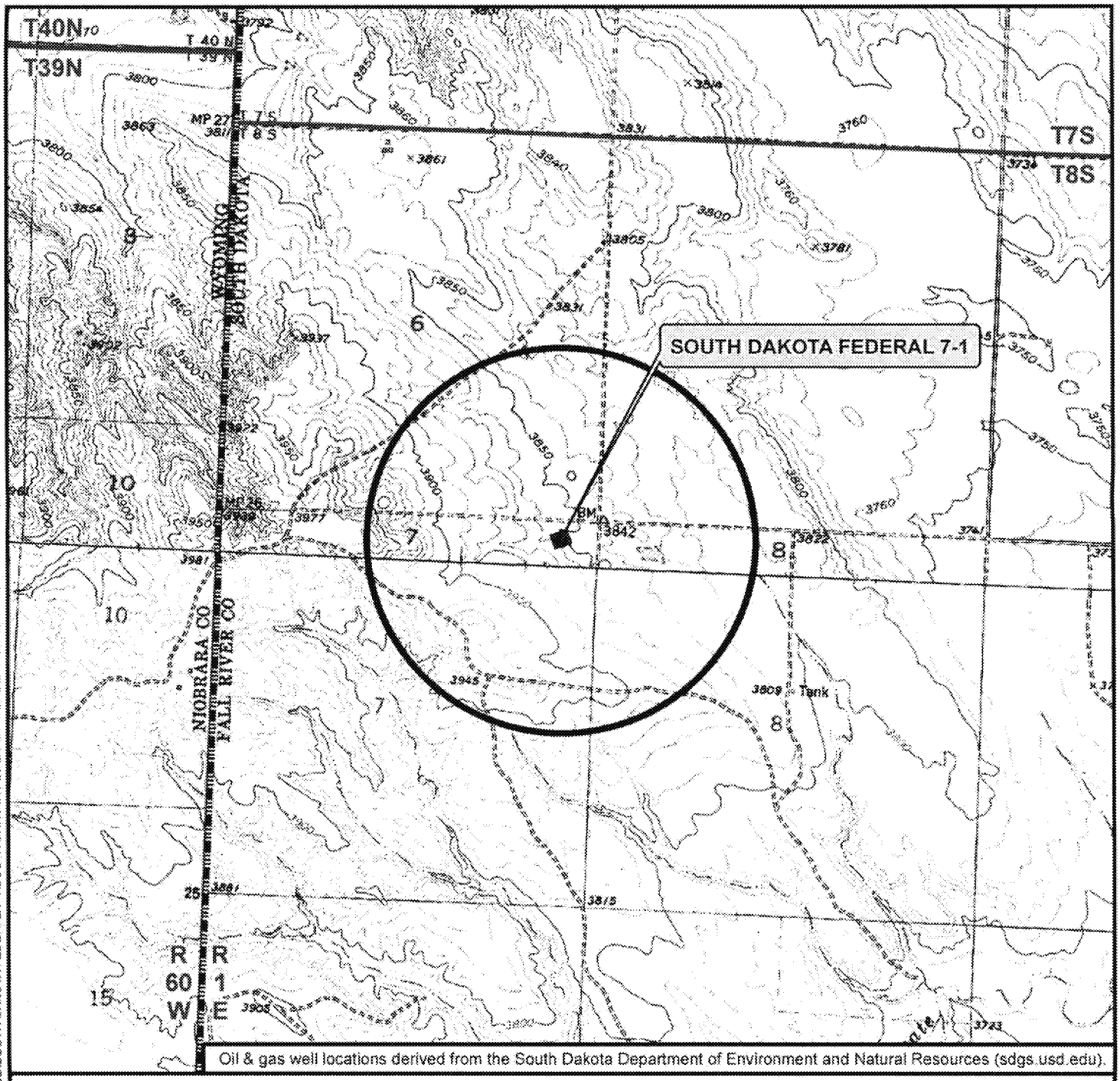
WELL LEGAL PLAT

SOUTH DAKOTA FEDERAL 7-1
261' FNL & 516' FEL (SURFACE POSITION)
NE1/4 NE1/4, SECTION 7
T8S, R1E, B.H.M.
FALL RIVER COUNTY, SOUTH DAKOTA

Prepared For:
TC
T-C OIL COMPANY, LLC
427 FM 774
REFUGIO, TEXAS 78377

609 CONSULTING, LLC
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609
Fax 307-674-0182

DRAFTED BY: SJM	CHECKED BY: WJG	SHEET NO: 1
DATE DRAFTED: 4/24/19	DATE SURVEYED: 4/4/19	
REVISED:	FILE NAME: 18-225	1 OF 1



Legend

- Well - Proposed
- Well Pad - Proposed
- Half-Mile Radius
- Injecting
- Plugged and Abandoned
- Producing
- Shut In
- Spudded
- Temporarily Abandoned

RECEIVED
MAY 28 2019
DEPT OF ENVIRONMENT & NATURAL RESOURCES

EXCEPTION LOCATION MAP

SOUTH DAKOTA FEDERAL 7-1
LOCATED IN NENE OF SECTION 7
T8S, R1E, B.H.M.
FALL RIVER COUNTY, SOUTH DAKOTA

Prepared For:
T-C OIL COMPANY, LLC
427 FM 774
REFUGIO, TEXAS 78377

609 CONSULTING, LLC
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609
Fax 307-674-0182

N

SCALE: 1" = 2,000ft	NAD83 SD-Sft	SHEET NO: 1
DRAWN: TL	DATE: 18 Apr 2019	1 OF 1
REVISED:	DATE:	

K:\T-C OIL\18-225_SOUTH_DAKOTA_SEC7_T8S_R1E\GIS\Maps_ABC\SOUTH DAKOTA FEDERAL 7-1\SOUTH DAKOTA FEDERAL 7-1 EXCEPTION LOCATION MAP.mxd 4/22/2019 10:54:06 AM

ATTACHMENT 6

Seagull Environmental Technologies, Inc.

3555 Chase Street
Wheat Ridge, CO 80212
www.seagullenvirotech.com

September 24, 2014

Victor Ketellapper, Site Assessment Team Leader
U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Preliminary Assessment Report regarding the Darrow/Freezeout/Triangle Uranium Mine Site near Edgemont, South Dakota
EPA ID: SDN000803095
EPA Region 8 START 8(a) Carve-Out Contract EP-S8-11-05, Task Order 0014
Task Monitor: Victor Ketellapper, Site Assessment Team Leader

Dear Mr. Ketellapper:

Seagull Environmental Technologies, Inc. (Seagull) is pleased to submit the attached Preliminary Assessment report regarding the Darrow/Freezeout/Triangle Uranium Mine site near Edgemont, South Dakota. Please contact the Project Manager via email at rlunt@seagullenvirotech.com or by phone at (720) 459-7874 if you have any questions.

Sincerely,

Ryan M. Lunt

Ryan M. Lunt
Task Order Project Manager

Hieu Q. Vu, PE
EPA Region 8 START 8(a) Program Manager

Enclosures

PRELIMINARY ASSESSMENT REPORT

Regarding the

DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

NEAR EDGEMONT, SOUTH DAKOTA

EPA ID: SDN000803095

Contract No.: EP-S8-11-05
Task Order No.: 0014

Prepared By:

SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.
3555 CHASE STREET
WHEAT RIDGE, COLORADO 80202-1129

September 24, 2014

PRELIMINARY ASSESSMENT REPORT APPROVED BY:

Hieu Q. Vu, PE, Program Manager — September 24, 2014 Date

Lynn Parman, PG, CHMM, QA/QC Manager — September 24, 2014 Date

Ryan M. Lunt, CHMM, Task Order Project Manager — September 24, 2014 Date

Victor Ketellapper, EPA Region 8, Site Assessment Team Leader — Sep 24 2014 Date

DISTRIBUTION LIST

U.S. ENVIRONMENTAL PROTECTION AGENCY

Victor Ketellapper (1 Copy)	Site Assessment Team Leader

SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.

Hieu Q. Vu (1 Copy)	Program Manager, START 8(a) Carve-Out, EPA Region 8
File (1 Copy)	START 8(a) Carve-Out, EPA Region 8

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Appendix

1.0 INTRODUCTION

Under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Carve-Out 8(a) Contract (No. EP-S8-11-05), Task Order No. 0014, Seagull Environmental Technologies, Inc. (Seagull) has been tasked to conduct a Preliminary Assessment (PA) of the Darrow/Freezeout/Triangle Uranium Mine site (the Site) near Edgemont, Custer and Fall River Counties, South Dakota. This PA is to determine whether the site poses a threat to human health and the environment and if further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted.

This PA was conducted in accordance with *Guidance for Performing Preliminary Assessments Under CERCLA* (EPA 1994). The Site is listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database as EPA ID SDN000803095. The CERCLIS non-National Priorities List (NPL) status of the site as of February 7, 2014, was "Ongoing Preliminary Assessment" (EPA 2014a).

2.0 OBJECTIVES

Objectives of this PA were to:

- Evaluate existing information and analytical data.
- Assess presence, quantity, or absence of uranium-mine-related contaminants at the Site.
- Document any releases to the environment from the Site.
- Acquire information regarding exposure pathways, surrounding population density, and other target data, including environmentally sensitive receptors (wetlands, fisheries, and threatened or endangered species).
- Assess whether the Site warrants further investigation under CERCLA.
- Identify data gaps or limitations of existing data reviewed in this PA.

3.0 SITE LOCATION AND DESCRIPTION

The Site is near Edgemont, in Custer and Fall River Counties, South Dakota. Geographic coordinates at the approximate center of the site are 43.478486 degrees north latitude and 103.962746 degrees west longitude. Currently used primarily for cattle grazing, the Site encompasses approximately 1,426 acres at the southwest edge of the Black Hills uplift approximately 13 miles northwest of Edgemont, South Dakota (see Figures 1 and 2).

The Site lies within the proposed Dewey-Burdock in-situ uranium recovery (ISR) project area. ISR is a means of extracting uranium from underground ore bodies through a series of injection and production

wells, and pumping it to the surface for production of nuclear fuel (Powertech Uranium Corporation [Powertech] 2014). In 2009, Powertech submitted the Dewey-Burdock Project Application Technical Report in order to obtain a U.S. Nuclear Regulatory Commission (NRC) Uranium Recovery License for working within the Proposed Action Area (PAA) (Powertech 2009). The PAA boundary encompasses approximately 10,580 acres of mostly private land, including a series of sequentially developed well fields, a satellite ion exchange facility, a central processing plant, and associated facilities to recover and process the final uranium product. The NRC prepared a draft Supplemental Environmental Impact Statement (SEIS) to evaluate potential environmental impacts from proposed construction, operation, aquifer restoration, and decommission of an ISR uranium facility at the proposed site (NRC 2012). The Final Environmental Impact Statement (EIS) was completed in January 2014 (NRC 2014a). The technical report completed by Powertech included results of baseline sampling within the PAA. Sampling data from the area of the Site obtained during that effort were used for this PA to evaluate conditions at the Site. Mining waste remains in abundance at the Site, and is suspected to be a source of radionuclide contamination to nearby streams and groundwater (see Figure 2).

The site is within the Great Plains physiographic province, where vegetation is a mix of short grasses and shrubs typical of semi-arid steppe land, along with Ponderosa Pine forest toward the Black Hills. Most of the surrounding land is used for rangeland (Powertech 2009).

3.1 SITE HISTORY

The Site is an abandoned uranium mine. Uranium was discovered in the Edgemont area in 1952 (Powertech 2009). Early mining of the material was limited to surface deposits; however, later drilling revealed deeper deposits. In the mid-1970s, the Tennessee Valley Authority (TVA) purchased a major interest in the Edgemont area and hired Silver King Mines, Inc., to explore the property. However, in the mid-1980s, the operation was halted due to an economically unsustainable decline in uranium prices. In 1994, Energy Fuels Nuclear (EFN) acquired the property but relinquished it due to low uranium prices. Surface land rights and mineral rights in the site area belong to private owners and the U.S. government (Powertech 2012a, b).

A number of uranium mine sites have been investigated under Superfund authority, as these sites can present potential for (1) public exposure to radon and other radionuclides, (2) contamination of groundwater and surface water supplies (via acid drainage and mobilization of heavy metals), (3) natural habitat disturbance, (4) increased instability of the land via erosion and slope stability failure, and (5) other physical safety hazards. Therefore, these sites may pose a threat to nearby human health and the environment (EPA 2007).

3.2 CURRENT SITE CONDITIONS

During a site reconnaissance on November 5, 2013, Seagull team members and EPA traveled along public roads in the vicinity of the Site in an unsuccessful attempt to identify a vantage point from which to view the Site. Photos of the area of the Site—including drainage areas, historical points of interest, and current conditions of the surrounding area—were taken during this site reconnaissance (see Appendix A). START and EPA visited Edgemont City Hall to meet with local officials to discuss purposes of the PA and to obtain information for the report. Following the meeting with local officials, the City Engineer/Code Administrator of Edgemont accompanied START and EPA to visit areas of interest in and around Edgemont, including the nearby uranium mill tailings repository and location of the former mill. The visit also included travel to current City of Edgemont Public Water Supply (PWS) wells to confirm their locations.

4.0 SITE CHARACTERISTICS

The following sections discuss the geology and hydrogeology, hydrology, and meteorology of the site vicinity.

4.1 GEOLOGY AND HYDROGEOLOGY

The Site is within the Black Hills; soils within the Site's boundaries are generally clayey or silty, with patches of sandy loam on upland areas and clay in or near drainages. The level upland areas have deep soils, and shallow soils are on hills, ridges, and breaks (NRC 2012). Wide areas of unconsolidated alluvial and terrace deposits of Quaternary age overlie the sedimentary rocks of Cretaceous and Jurassic age. The sedimentary rocks include the Cretaceous-age Belle Fourche Shale, Granerous Group (Mowry Shale and Skull Creek Shale), and Inyan Kara Group (Fall River and Lakota Formations). The Fall River Formation consists of sandstone, siltstone, and interbedded sandstone and shale. The Lakota Formation consists of the Fuson Member (shale and siltstone with discontinuous sandstone) and Chilson Member (interbedded shale and sandstone, and a basal mudstone). The Chilson Member is also known as the Lakota Sandstone (Schnabel 1963, NRC 2012).

The Jurassic-age Morrison and Sundance Formations underlie the Inyan Kara Group. The Morrison Formation consists of shale and claystone interbedded with limestone. The Sundance Formation is composed of the Stockade Beaver Member (shale), Hulett Member (sandstone), Lak Member (sandstone, siltstone, and mudstone), and Redwater Member (shale) (Schnabel 1963).

Many occurrences of uranium minerals have been prospected within the Burdock quadrangle. Generally, the ore minerals occur as impregnations in sandstone, siltstone, and mudstone beds, but not consistently

in a carbonaceous environment. Uranium and vanadium minerals from these deposits have been identified as uraninite, carnotite, and tyuyamunite. Corvusite and rauvite are probably present in some of the deposits, although these have not been positively identified. The uranium minerals are restricted to the sandstone and sandy or silty facies in the Fall River Formation and the sandstone in the Chilson Member of the Lakota Formation (Schnabel 1963).

Major aquifers in the Black Hills area include (from top to bottom) the Inyan Kara Group, Minnekahta, Minnelusa, Madison, and Deadwood aquifers (see Appendix B). These aquifers are separated by confining layers with low permeability, except where they outcrop (NRC 2012). The Inyan Kara Group aquifer ranges from 250 to 500 feet thick and contains two subaquifers, the Fall River aquifer and Chilson aquifer, which are separated by the Fuson Shale. Aquifer pumping tests have provided data indicating a hydraulic connection between the Lakota and Fall River Formations through the intervening Fuson Shale in the Burdock area (NRC 2012). The Inyan Kara Group aquifer is separated from the Minnekahta aquifer by the Morrison Formation (60 to 140 feet thick), Sundance/Unkpapa aquifer (a minor aquifer), Gypsum Spring Formation, and the Spearfish Formation (320 feet thick). The Minnekahta aquifer ranges in thickness from 25 to 65 feet. Underlying the Minnekahta aquifer is the Opeche Shale (a confining layer) and the Minnelusa aquifer. The Minnelusa aquifer ranges in thickness from 375 to 1,175 feet. Confining layers are present at the base of the Minnelusa Formation; however, locally, these confining layers may be absent or provide ineffective confinement from the underlying Madison aquifer. The Madison aquifer is the most important aquifer in the region, supplying municipal water for numerous communities, including Rapid City and Edgemont, South Dakota. The Madison Formation is 200 to 1,000 feet thick and mainly consists of a dolomite unit characterized by fractures and karst features. The Madison aquifer is separated from the underlying Deadwood aquifer by the low-permeability Whitewood, Winnipeg, and Englewood Formations (NRC 2012). With the exception of Edgemont, which has two municipal wells in the Madison aquifer, the deeper aquifers are not used as a source of water in the area (Powertech 2009).

The hydrogeologic setting in the Black Hills area also involves minor aquifers, which include the Sundance/Unkpapa, Newcastle, and alluvial aquifers. These minor aquifers yield small volumes of water locally for domestic and stock uses. Alluvial aquifers with thicknesses of 0 to 50 feet are along Beaver Creek, Pass Creek, and the Cheyenne River. They are typically unconfined, but may be confined locally. Alluvial aquifers are separated from the underlying Fall River Formation by the low-permeability Graneros Group confining unit. An alluvial drilling program completed in 2012 did not indicate any areas of discharge to the alluvium along Beaver Creek and Pass Creek from the underlying Fall River aquifer (NRC 2012).

Groundwater in the Fall River and Chilson aquifers flows from northeast to southwest. Regionally, groundwater flows radially outward from the Black Hills toward the surrounding plains (NRC 2012).

Groundwater Levels

Regionally, groundwater levels in alluvial aquifers range from 14.4 to 22.5 feet below ground surface (bgs). Groundwater levels in the Fall River aquifer range from 80 to 680 feet bgs. Groundwater levels in the Chilson aquifer range from 196 to 1,000 feet bgs (Powertech 2009).

4.2 HYDROLOGY

The site lies within the Pass Creek sub-watershed, which comprises most of the east-southeast portion of the larger Beaver Creek watershed. The site is drained by Pass Creek and its tributaries. Located adjacent and east of the site, Pass Creek is an intermittent creek with periods of high runoff following major storm events. No permanent stream flow gages are stationed along Pass Creek (Powertech 2009). Pass Creek flows southwest from the northwest boundary of the Site approximately 6 stream miles to Beaver Creek. Approximately 5.5 stream miles southeast of the confluence of Pass and Beaver Creeks, Beaver Creek flows into the Cheyenne River (Google Earth 2013). In 2013, the mean annual discharge from the Cheyenne River was 38.2 cubic feet per second (cfs), according to a gaging station in Edgemont, downstream of its confluence with Beaver Creek (U.S. Geological Survey [USGS] 2014).

4.3 METEOROLOGY

According to the High Plains Regional Climate Center's (HPRCC) station in Edgemont, the average maximum and minimum annual temperatures in the site area are 61.2 and 33.1 degrees Fahrenheit (°F), respectively. The annual average precipitation is 15.79 inches (HPRCC 2014).

5.0 PREVIOUS ANALYTICAL DATA

Analytical data from groundwater, surface water, sediment, soil, and air were collected within the study area by Powertech and were included in the Dewey-Burdock Project Application for NRC Uranium Recovery License Technical Report (Powertech 2009). These data were referenced in the Environmental Impact Statement (EIS) completed by the NRC.

5.1 GROUNDWATER

The following sections address groundwater sampling and results of that sampling.

5.1.1 Groundwater Sampling

According to a well inventory conducted by Powertech, the following wells are within a 4-mile radius of the Site boundary: one domestic well and five stock wells are within the Site boundary; one domestic well is within 0.25 mile of the Site; one domestic well and four stock wells are between 0.25 and 0.50 mile of the Site; one domestic well and six stock wells are within 0.50 and 1 mile of the Site; 12 stock wells are between 1 and 2 miles of the Site; eight domestic wells, 10 stock wells, and one irrigation well are between 2 and 3 miles of the Site; and six domestic and 10 stock wells are between 3 and 4 miles of the Site (Figure 3).

Powertech conducted groundwater sampling of wells at the proposed Dewey-Burdock ISR project area from October 2006 through February 2009 (see Figure 4). Groundwater samples were collected from domestic, stock, irrigation, monitoring, and temporary wells, the majority of which were downgradient of the Site. Groundwater samples were collected from wells in various aquifers: 17 wells were in the Fall River Formation, 19 wells were in the Lakota Formation (Chilson Member), two wells were in the Inyan Kara Group, three wells were in the Unkpapa Formation, two wells were in unknown aquifers, one well was in the Sundance Formation, and five wells were in alluvium. Generally, groundwater samples were collected for analysis for water quality parameters: major ions; metals, including mercury (total, suspended, and dissolved); and radionuclides (total, suspended, and dissolved).

USGS also conducted groundwater sampling in the Dewey-Burdock area during June 2011. USGS collected 28 groundwater samples from monitoring wells in and around the Dewey-Burdock site that were screened in multiple aquifers.

During July 2012, American Engineering and Testing, Inc. installed additional alluvial groundwater monitoring wells in the area of the Site to supplement the groundwater monitoring results included in the initial application submitted to NRC by Powertech. The additional wells were compliance point wells within the alluvial aquifers along Beaver Creek and Pass Creek (see Figure 5). The wells were sampled monthly by Powertech from July 2012 to June 2013. Most of the samples were analyzed for water quality measurements, metals (including mercury), and dissolved radionuclides.

5.1.2 Groundwater Analytical Results Summary

Groundwater sampling results indicated that in 36 of 49 samples, at least one analyte exceeded the Maximum Contaminant Level (MCL). Of 38 groundwater samples collected from the proposed ore-bearing aquifer, 28 contained analyte concentrations exceeding at least one MCL for drinking water (NRC 2012). The designated crossgradient background well (Well 650) contained concentrations of the

contaminants of concern, including total and dissolved radium-226 (Ra-226) (3.2/2.7 picocuries per liter [pCi/L]), total and dissolved uranium (0.4/1.9 micrograms per liter [µg/L]), and dissolved gross alpha (13.1 pCi/L). None of these background concentrations exceeded its MCL.

Samples collected from Wells 615, 684, and 3026, which were screened within the Chilson aquifer, exceeded the MCL for arsenic (0.01 milligram per liter [mg/L]); Wells 650 and 689, also within the Chilson aquifer, exceeded the EPA action level for lead (0.015 mg/L). Samples from Well 622 in the Fall River aquifer and from Wells 676 and 679 in alluvial aquifers along Pass Creek exceeded the MCL for arsenic and EPA action level for lead. Samples from Wells 681 and 688 in the Fall River aquifer exceeded the MCL for arsenic. The MCL for uranium (30 µg/L) was exceeded in samples collected from four of five wells sampled in the alluvial aquifers. Samples from Wells 42, 680, 684, and 3026 in the Chilson aquifer and Well 698 in the Fall River aquifer also exceeded the MCL for uranium. No MCLs for other metals were exceeded in any of the groundwater samples (NRC 2012).

Approximately 50 percent of the samples collected from the Fall River and Chilson aquifers for analysis for dissolved Ra-226 exceeded the MCL of 5 pCi/L. Dissolved Ra-226 levels exceeding the MCL ranged between 5.2 and 1,440 pCi/L. Approximately 75 percent of the samples collected from wells in the Fall River, Chilson, and alluvial aquifers for analysis for dissolved gross alpha exceeded the MCL of 15 pCi/L. Gross alpha levels exceeding the MCL in alluvial wells ranged between 18.3 and 129 pCi/L; however, gross alpha levels exceeding the MCL in the Fall River and Chilson aquifers were higher, ranging from 15.1 to 6,730 pCi/L. Samples from wells 16, 619, 680, 688, and 692 contained dissolved Ra-226 ranging from 6.4 to 1,440 pCi/L, and dissolved gross alpha concentrations ranging from 17.3 to 6,730 pCi/L exceeding their respective MCLs; these wells are within a 1-mile radius of the Site boundary, and are crossgradient or downgradient of the Site.

A primary drinking water standard for radon-222 (Rn-222) has not been established; however, EPA has proposed a limit of 300 pCi/L (EPA 2000). Of samples from all the wells tested during baseline groundwater sampling, only the sample from Well 650 (background) did not exceed the proposed EPA limit; Well 650 is screened in the Chilson aquifer, and is crossgradient of the Site (NRC 2012). Concentrations of Rn-222 found to exceed the EPA's proposed limit for Rn-222 ranged from 11,247 to 17,092,120 Becquerels per cubic meter (Bq/m^3) (304 to 462,000 pCi/L). Wells 680 and 42 in the mapped ore bodies in the Chilson aquifer, and Well 681 in the Fall River aquifer, contained the highest concentrations of Rn-222. Well 42 provides water for domestic use and stock water (NRC 2012).

Groundwater samples collected from all domestic wells except Well 8 contained concentrations of at least one analyte that exceeded its MCL. Groundwater samples exceeding MCLs for uranium (total and

dissolved), Ra-226 (total and dissolved), dissolved gross alpha, and arsenic, and the EPA action level for lead, are listed in Table 1.

TABLE 1

GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009

Well ID	Aquifer	Well Description	Ra-226 (Total) (pCi/L)	Ra-226 (Dissolved) (pCi/L)	Uranium (Total) (µg/L)	Uranium (Dissolved) (µg/L)	Gross Alpha (Dissolved) (pCi/L)	Arsenic (mg/L)	Lead (mg/L)
2	Chilson	Domestic/Stock	--	--	--	--	--	--	--
4	Unknown	Stock	--	--	--	--	--	--	--
5	Fall River	Stock	--	--	--	--	--	--	--
7	Fall River	Domestic	--	--	--	--	15.5 – 17.0	--	--
8	Fall River	Domestic	--	--	--	--	--	--	--
13	Chilson	Domestic	--	--	--	--	19.5	--	--
16	Chilson	Domestic	17.4	6.4 – 33.6	--	--	28.3 – 110	--	--
18	Fall River	Domestic	--	5.8	--	--	15.7 – 37.0	--	--
41	Unknown	Stock	--	16.5	--	--	88	--	
42	Chilson	Domestic	79.7	87.6 – 102	--	32.4 – 40	371 – 560	--	--
49	Fall River	Stock	--	--	--	--	--	--	--
615	Chilson	Monitoring	--	7.2	--	--	15.1 – 38.3	0.021 – 0.024	--
619	Chilson	Stock	120	99.7 – 120	--	--	341 – 438	--	--
622	Fall River	Monitoring	--	7.9	--	--	22.6 – 1,470	0.027	0.023 – 0.03
628	Inyan Kara	Stock	6.8	6.1 – 20.7	--	--	29.9 – 83.9	--	--
631	Fall River	Stock	15.2	9.5 – 22.1	--	--	46.5 – 162	--	--
635	Sundance	Stock	--	--	--	--	--	--	--
650	Chilson	Stock (background)	--	--	--	--	--	--	0.05
675	Alluvial	Alluvial	--	--	38.7 – 50.2	30.7 – 49.3	18.3 – 55.2	--	--
676	Alluvial	Alluvial	--	--	59.1 – 68.7	49.4 – 58.6	31.9 – 95.5	0.021	0.06
677	Alluvial	Alluvial	--	--	41.4 – 47.1	40.2 – 45.0	38.7 – 129	--	--
678	Alluvial	Alluvial	--	--	37.9 – 38.7	34.9 – 36.8	18.9 – 54.7	--	--
679	Alluvial	Alluvial (background)	--	--	--	--	18.4 – 22.4	0.011	0.015 – 0.022

TABLE 1 (Continued)

GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009

Well ID	Aquifer	Well Description	Ra-226 (Total) (pCi/L)	Ra-226 (Dissolved) (pCi/L)	Uranium (Total) (µg/L)	Uranium (Dissolved) (µg/L)	Gross Alpha (Dissolved) (pCi/L)	Arsenic (mg/L)	Lead (mg/L)
680	Chilson	Test Well	--	1,110 – 1,440	54.1	30.3 – 172	4,090 – 6,730	--	--
681	Fall River	Test Well	--	258 – 445	--	--	656 – 2,220	0.024	--
682	Chilson	Monitoring	--	--	--	--	50.3	--	--
683	Fall River	Monitoring	--	--	--	--	--	--	--
684	Chilson	Monitoring	--	543	336	66.7	1890	0.04	--
685	Fall River	Monitoring	--	--	--	--	23.8	--	--
686	Chilson	Monitoring	--	--	--	--	--	--	--
687	Fall River	Monitoring	--	25.7	--	--	114	--	--
688	Fall River	Test Well		6.7 – 7.9	--	--	17.3 – 29.8	0.015	--
689	Chilson	Test Well	--	5.4 – 7.9	--	--	23.9 – 64.3	--	0.017
690	Unkpapa	Monitoring	--	--	--	--	--	--	--
691	Fall River	Monitoring	--	--	--	--	--	--	--
692	Chilson	Monitoring	--	484	--	--	1450	--	--
693	Unkpapa	Monitoring	--	--	--	--	--	--	--
694	Fall River	Domestic	--	--	--	--	20.2 – 23.9	--	--
695	Fall River	Stock	--	5.2–6.3	--	--	15.9 – 52.2	--	--
696	Chilson	Domestic	--	--	--	--	15.1 – 25.9	--	--
697	Chilson	Stock	--	5.6	--	--	18.2 – 21.7	--	--
698	Fall River	Weather Station	--	347 – 429	101 – 132	99.8 – 119	36.3 – 2,110	--	--
703	Unkpapa	Domestic	--	--	--	--	42.6	--	--
704	Chilson	Monitoring	--	--	--	--	--	--	--
705	Chilson	Monitoring	--	--	--	--	--	--	--

TABLE 1 (Continued)

**GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009**

Well ID	Aquifer	Well Description	Ra-226 (Total) (pCi/L)	Ra-226 (Dissolved) (pCi/L)	Uranium (Total) (µg/L)	Uranium (Dissolved) (µg/L)	Gross Alpha (Dissolved) (pCi/L)	Arsenic (mg/L)	Lead (mg/L)
706	Fall River	Monitoring	--	--	--	--	20.5 – 56.3	--	--
3026	Chilson	Stock	--	9.5 – 10.4	32.2	--	15.4 – 116	0.022–0.044	--
4002	Inyan Kara	Stock	62.7	52.3 – 63.6	--	--	120 – 314	--	--
7002	Chilson	Stock	6.3	8.0 – 8.8	--	--	29.5 – 91.4	--	--
MCL			**5**	**5**	**30**	**30**	**15**	**0.01**	**0.015[a]**

Source: Powertech 2012c

Notes:

[a] EPA action level
-- Below the MCL or not analyzed
ID Identification
MCL Maximum Contaminant Level
mg/L Milligrams per liter
pCi/L Picocuries per liter
Ra-226 Radium-226
µg/L Micrograms per liter

Samples collected by USGS from Wells 676 and 678 (also sampled by Powertech), which were screened in the alluvial aquifer along Pass Creek, exceeded the MCL for uranium. Additionally, a sample collected from Well 698 (also sampled by Powertech), screened in the Fall River aquifer and immediately downstream of runoff from the Site, also exceeded the MCL for uranium (Johnson 2012).

Samples collected by Powertech from monitoring wells in 2012 and 2013 contained concentrations of gross alpha that exceeded its MCL (15 pCi/L). Well BC1, downgradient of the Site, was the only well that contained a concentration of uranium above its MCL. As previously mentioned, a primary drinking water standard for Rn-222 has not been established; however, EPA has proposed a limit of 300 pCi/L (EPA 2000). All groundwater samples collected from the alluvial monitoring wells contained concentrations of Rn-222 that exceeded 300 pCi/L. A summary of groundwater results from the alluvial monitoring wells in the area of the Site is in Table 2 below.

TABLE 2

MONITORING WELL SUMMARY DATA
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2012-2013

Well ID	Sample Location	Ra-226 (pCi/L)	Uranium (pCi/L)	Gross Alpha (pCi/L)
BC1	Pass Creek watershed	--	75.7 – 111	50.1 – 108
BC2	Pass Creek watershed	--	--	20.0 – 38.9
BC3	Pass Creek watershed	--	--	19.3 – 43.5
DC1	Beaver Creek watershed	--	--	15.9 – 88.7
DC2	Beaver Creek watershed	--	--	20.7 – 41.7
DC3	Beaver Creek watershed	--	--	--
DC4	Beaver Creek watershed	--	--	16.5 – 29.6
MCL		**5**	**30**	**15**

Source: Powertech 2013

Notes:
-- Below the MCL or not analyzed
ID Identification
MCL Maximum Contaminant Level
pCi/L Picocuries per liter
Ra-226 Radium-226

5.2 SURFACE WATER AND SEDIMENT

The following sections address analytical data from surface water and sediment samples collected at the study area. Sample locations are shown on Figure 6.

5.2.1 Surface Water Sampling

Surface water samples were collected monthly between July 2007 and June 2008 from perennial and ephemeral streams near the area of the Site. The perennial streams, Beaver Creek and the Cheyenne River, were each sampled at two locations. The ephemeral streams included Pass Creek, Bennett Canyon, and an unnamed tributary (see Figure 6). Passive samplers were installed at the ephemeral stream locations to collect samples during flow events. Two sample locations were on Pass Creek, while samples were to be collected at one location each at Bennet Canyon and the unnamed tributary (Powertech 2009). The Bennet Canyon sample location was absent of water during both sampling periods.

Surface water samples were also collected at impoundment locations in the area of the Site during 2007-2008. In all, 48 impoundments had been identified on aerial photographs and topographic maps prior to field activities and were subsequently field-verified. A subset of 11 impoundments were chosen from the total of 48, based on presence of water during sampling activities and spatial distribution of the impoundments. The locations included the Darrow Pit, Triangle Pit, and nine other impoundments (see Figure 6). Some of the impoundments on the site meet the definition of "surface impoundment" described in Hazard Ranking System (HRS) Table 2-5, indicating they could also be evaluated as potential sources of contamination for HRS scoring purposes (EPA 2011).

5.2.2 Surface Water Analytical Results Summary

Total gross alpha concentrations were detected at all seven sample locations and ranged from 1.9 to 65.8 pCi/L. The highest concentration was detected in a sample collected at the downstream Beaver Creek location. Total and dissolved uranium were detected in every sample except the one collected from the unnamed tributary. The highest concentrations of total uranium (37.8 µg/L) and dissolved uranium (36.8 µg/L) were in a sample collected at the downstream Cheyenne River location. Total and dissolved Ra-226 were detected at concentrations ranging from 0.2 to 5.1 pCi/L. The highest detections occurred in samples collected at the downstream sample locations on Beaver Creek and the Cheyenne River. Total and dissolved Pb-210 were detected at concentrations up to 35 pCi/L. The highest concentration was detected at the upstream sample location on Beaver Creek.

Samples collected at downstream locations on Beaver Creek and Pass Creek met observed release criteria by containing analytes that exceeded three times background concentrations. The sample collected downstream on Pass Creek contained elevated concentrations of gross alpha (8.8 pCi/L), and total and dissolved uranium (25.2/5.0 µg/L), meeting observed release criteria. The sample collected downstream on Beaver Creek contained elevated concentrations of gross alpha (65.8 pCi/L); however, the

concentration did not meet observed release criteria. Additionally, a sample collected at the downstream location on the Cheyenne River contained an elevated concentration of Pb-210 (22.0 pCi/L) that met observed release criteria. However, that downstream sampling location on the Cheyenne River was beyond the 15-mile Target Distance Limit (TDL).

Analytical results from surface water samples are listed in Table 3 (Powertech 2012). To summarize the surface water data, the highest downstream detections of each analyte are listed with the corresponding upstream sample results from the same sampling event. For example, the highest concentration of total gross alpha at the downstream Beaver Creek location was detected in a sample collected on November 19, 2007 (65.8 pCi/L at BVC01). Therefore, the total gross alpha concentration detected in the upstream Beaver Creek sample collected on November 19, 2007 (34.7 pCi/L at BVC04), is also listed in the table. The date on which concentrations of Pb-210 were detected at the Cheyenne River downstream location had no counterpart date of Pb-210 data acquisition at the upstream location; thus data obtained on the date of upstream data acquisition closest to the date of data acquisition at the downstream location were used for the comparison. No Superfund Chemical Data Matrix (SCDM) benchmarks have been established for radionuclides in surface water.

TABLE 3

**RADIOLOGICAL DATA FOR SURFACE WATER SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2007-2008**

Sample Location	Sample Description	Gross Alpha Total (pCi/L)	Uranium (µg/L)		Ra-226 (pCi/L)		Pb-210 (pCi/L)	
			Total	Dissolved	Total	Dissolved	Total	Dissolved
BVC04	Beaver Creek–upstream	34.7	6.1	5.6	2.2j	-0.06j	35	26
BVC01	Beaver Creek–downstream	65.8	26.2	26.9	5.1	2.0	14.0	11.0
CHR01	Cheyenne River–upstream	35.3	32.0	30.8	4.1	0.06j	<1	<1
CHR05	Cheyenne River–downstream	29.9	37.8	36.8	5.1	1.4	22.0	<1
PSC02	Pass Creek–upstream	1.9	5.7	0.7	<0.2	NM	0.0j	1.7j
PSC01	Pass Creek–downstream	8.8	25.2	5.0	0.7	NM	3.0j	2.2j
UNT01	Unnamed Tributary	6.1	0.9	ND	0.3	0.2	NA	NA

Source: Powertech 2012d

Notes:

Shaded result indicates the value exceeds three times the background (upstream) level (or above the detection limit if non-detect in the background sample).

<	Less than
ID	Identification
j	Not detected above minimum detectable concentration
NA	Not analyzed
ND	Non detect
NM	Not measured in field/not requested for analysis from laboratory
Pb-210	Lead-210
pCi/L	Picocuries per liter
Ra-226	Radium-226
µg/L	Micrograms per liter

Samples collected from the Darrow Pit (Sub06) and the Triangle Mine Pit (Sub02) contained the highest radionuclide concentrations of the 11 impoundment samples. Total gross alpha was detected at 8,750 pCi/L at location Sub06 and 199 pCi/L at location Sub02. Total and dissolved uranium were detected at 7,380 and 7,840 pCi/L, respectively, at location Sub06, and at 190 and 177 pCi/L, respectively, at location Sub02. In addition, samples collected at Sub01, Sub03, Sub04, Sub09, and Sub10 contained concentrations of total gross alpha ranging from 15.9 to 19.9 pCi/L. Samples collected from Sub01, Sub06, and Sub08 through Sub11 contained concentrations of total Pb-210 ranging from 1.1 to 8.2 pCi/L. Samples collected from Sub02, Sub08, and Sub11 contained concentrations of dissolved

Pb-210 ranging from 1.5 to 4.6 pCi/L. Maximum results for each surface water impoundment in the area of the Site are listed in Table 4.

TABLE 4

**RADIOLOGICAL DATA FOR SURFACE WATER IMPOUNDMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2007-2008**

Sample Location	Sample Description	Gross Alpha Total (pCi/L)	Uranium (µg/L)		Ra-226 (pCi/L)		Pb-210 (pCi/L)	
			Total	Dissolved	Total	Dissolved	Total	Dissolved
Sub01	Stock pond	16.2	2.0	0.3	1.2	0.5	-1.4 j	0.7
Sub02	Triangle Mine Pit	199	190	177	0.6	0.7	0.5	0j
Sub03	Mine dam	19.9	3.1	2.3	4.0	4.5	-3.8j	-3.0j
Sub04	Stock pond	13.6	2.4	2.1	3.5	3.4	-3.0j	-2.1j
Sub05	Mine dam	NS	NS	NS	NS	NS	NS	NS
Sub06	Darrow Mine Pit - Northwest	8,750	7,380d	7,840	2.0	4.3	3.1	-0.6j
Sub07	Stock dam	5.8	1.3	2.4	0.8	0.8	-0.8j	-1.4j
Sub08	Stock pond	14.1	2.3	2.8	0.5	0.5	5.3	4.6
Sub09	Stock pond	15.9	2.3	5.6	0.5	0.1	3.6	-0.9j
Sub10	Stock pond	16.3	3.3	2.7	1.2	0.2	5.3j	0.1
Sub11	Stock pond	9.4	1.6	33.6d	0.9	0.7	8.2	3.2

Source: Powertech 2012d

Notes:

<	Less than
d	Reporting limit increased due to sample matrix interference
ID	Identification
j	Not detected above minimum detectable concentration
NS	Not sampled because no water present
Pb-210	Lead-210
pCi/L	Picocuries per liter
Ra-226	Radium-226

5.2.3 Sediment Sampling

Sediment samples were collected by Powertech at collocated surface water sample locations previously cited in Section 5.2.1 (see Figure 6). At each location, four sample aliquots were collected by use of a plastic hand trowel to a depth of 5 centimeters (cm), along a transect spanning the width of the channel in areas where sediment had been deposited. The aliquots were then composited into a single sample to represent the average radionuclide concentration across the channel (Powertech 2009).

Additional sediment samples were collected in the area of the Site from on-site impoundments described in Section 5.2.1. At each location, a single sample was collected by use of a trowel to a depth of 5 cm. Samples were collected near the edge of the water at locations appearing relatively undisturbed. At dry impoundments, sediment samples were collected within areas determined likely to be submerged if water would be present (Powertech 2009). The sediment samples were analyzed for natural uranium, Ra-226, thorium-230 (Th-230), and Pb-210 (Powertech 2009).

5.2.4 Sediment Analytical Results Summary

Samples collected at the downstream Pass Creek location (PSC01) exceeded three times background concentrations for all analytes, thereby meeting observed release criteria. Additionally, a sample collected at the downstream Cheyenne River location (CHR05) exceeded three times the background level for uranium, thereby meeting observed release criteria. Table 5 summarizes analytical results from sediment samples collected at locations on Pass Creek, Beaver Creek, the Cheyenne River, Bennet Canyon, and an unnamed tributary.

TABLE 5
RADIOLOGICAL DATA FROM STREAM SEDIMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2008

Sample Location	Sample Description	Sample Date	U-nat Total (mg/kg-dry)	Ra-226 Total (pCi/g-dry)	Pb-210 Total (pCi/g-dry)	Th-230 Total (pCi/g-dry)
BEN01	Bennet Canyon	6/23/2008	1.8	0.6	2.3U	0.6
		8/21/2008	2.4	0.6	2.0	0.5
BVC04	Beaver Creek-upstream	6/17/2008	2.0	1.5	1.9U	0.7
		8/21/2008	2.0	1.0	1.8	1.0
BVC01	Beaver Creek-downstream	6/17/2008	2.0	1.3	0.5U	0.8
		8/21/2008	2.0	0.6	2.6	1.2
CHR01	Cheyenne River-upstream	6/17/2008	1.7	1.0	0.2U	0.6
		8/21/2008	2.7	0.9	1.7	1.4
CHR05	Cheyenne River-downstream	6/17/2008	6.2	2.1	1.7U	1.9
		8/21/2008	1.2	0.6	1.3	0.5
PSC02	Pass Creek-upstream	6/17/2008	1.1	0.6	1.2U	0.4
		8/21/2008	1.0	0.4	0.4U	0.4
PSC01	Pass Creek-downstream	6/17/2008	3.9	2.9	4.7	2.0
		8/21/2008	6.5	1.8	4.0	4.1
UNT01	Unnamed Tributary	6/23/2008	2.0	0.8	2.2U	0.5
		8/21/2008	2.5	0.7	1.7	1.0

Source: Powertech 2009

Notes:

Shaded result indicates the value exceeds three times the background (upstream) level (or above the detection limit if non-detect in the background sample).

ID Identification
mg/kg Milligrams per kilogram
NE Not established
Pb-210 Lead-210
pCi/g Picocuries per gram
Ra-226 Radium-226
Th-230 Throium-230
U Analyte not detected at or above the reporting limit
U-nat Natural uranium

Uranium concentrations in samples from the Darrow Mine Pit – Northwest (Sub06) and Triangle Mine Pit (Sub02) ranged from 18 to 37 mg/kg. Samples from two mine dams (Sub03 and Sub05) and one stock pond (Sub04) contained concentrations of uranium ranging from 4.2 to 8.5 mg/kg. Samples collected from Sub02, Sub05, and Sub06 contained concentrations that exceeded three times background concentrations of uranium, Ra-226 and Th-230, meeting observed release criteria. The sample collected at location Sub03 also contained a concentration of Ra-226 that exceeded three times background, meeting observed release criteria. The sample quantitation limit (SQL) for Pb-210 could not be confirmed through laboratory data information, and therefore the data could not be used to establish an

observed release. Table 6 summarizes analytical results from sediment samples collected at impoundment locations throughout the area of the Site.

TABLE 6

**RADIOLOGICAL DATA FOR IMPOUNDMENT SEDIMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2008**

Sample Location	Location Description	Sample Date	U-nat Total (mg/kg-dry)	Ra-226 Total (pCi/g-dry)	Pb-210 Total (pCi/g-dry)	Th-230 Total (pCi/g-dry)
Sub01 (background)	Stock pond	6/18/2008	2.2	1.2	0.5U	0.7
		8/21/2008	3.3	1.1	1.0U	1.0
Sub02	Triangle Mine Pit	6/18/2008	18	3.9	2.8U	2.9
		8/21/2008	19	1.3	3.1	6.8
Sub03	Mine dam	6/18/2008	7.2	4.1	3.9	2.1
		8/21/2008	4.2	1.1	3.2	1.9
Sub04	Stock pond	6/17/2008	6.5	2.5	1.2U	0.9
		8/21/2008	5.1	0.7	2.1	1.8
Sub05	Mine dam	6/18/2008	8.5	4.2	4.2	2.4
		8/21/2008	6.0	3.0	2.8	2.3
Sub06	Darrow Mine Pit – Northwest	6/23/2008	37	8.6	9.6	7.8
		8/21/2008	32	5.2	4.0	5.9
Sub07	Stock dam	6/23/2008	1.7	0.7	0.6U	0.5
		8/21/2008	2.2	0.4	1.9	0.9
Sub08	Stock pond	6/23/2008	1.2	0.6	0.6U	0.4
		8/21/2008	1.9	0.4	1.7	0.8
Sub09	Stock pond	6/23/2008	2.4	1.0	1.5U	0.7
		8/21/2008	2.3	0.6	1.7	0.9
Sub10	Stock pond	6/23/2008	1.5	0.8	1.5U	0.7
		8/21/2008	2.1	0.6	0.9U	0.7
Sub11	Stock pond	6/23/2008	2.7	0.8	2.1U	0.5
		8/21/2008	1.8	0.6	1.5	0.8

Source: Powertech 2009
Notes:

Shaded result indicates a concentration that exceeds three times the background level (sample results from June 18, 2008)

ID Identification
mg/kg Milligrams per kilogram
Pb-210 Lead-210
pCi/g Picocuries per gram
Ra-226 Radium-226
Th-230 Thorium-230
U Analyte not detected at or above the reporting limit
U-nat Natural uranium

5.3 SOIL

The following sections address soil sampling and analytical results from soil sampling.

5.3.1 Soil Sampling

Powertech conducted soil sampling within the proposed Dewey-Burdock permit area, which included the area of the Site. Surface soil samples were collected from the top 15 cm by use of a hand shovel. All of the soil samples were analyzed for Ra-226. In all, 25 samples were collected at the area of the Site (Powertech 2009).

5.3.2 Soil Analytical Results Summary

Samples SMA-B01 through SMA-B29 (not consecutive) were collected at the area of the Site (see Figure 7). Sample SMA-B01 was the designated background sample. The sample results were compared to SCDM cancer risk (CR) screening levels for ingestion of soil, and the health-based standard of 5.0 pCi/g for Ra-226 in surface soil (15 pCi/g for subsurface soil) based on the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. That standard was developed for cleanup of radiation-contaminated soil, specifically uranium mill tailings sites. An EPA memorandum dated February 12, 1998, clarifies use of the UMTRCA soil cleanup standard for CERCLA sites (EPA 1998). The purpose of the standard was to limit risk from inhalation of radon decay products in houses built on mine tailings, and to limit gamma radiation exposure to people using contaminated land. The standard was developed to control the hazard from gamma radiation; therefore, this standard may be appropriate and relevant to CERCLA sites (EPA 1998).

Samples SMA-B03, -B07, -B09, -B10, -B11, -B13, -B14, -B15, -B19, -B21, and -B23 through -B30 contained concentrations of Ra-226 that exceeded the SCDM CR screening level of 1.0 pCi/g. Samples SMA-B26 through -B30, collected near the Triangle Mine Pit area and the Darrow Mine Pit, contained concentrations exceeding both the SCDM CR benchmark for Ra-226 and the UMTRCA standard for surface soil for Ra-226 of 5.0 pCi/g. Samples SMA-B07, -B23, -B26, -B28, and -B30 contained concentrations of Ra-226 at or above three times background (0.9 pCi/g), meeting observed release criteria. The exact location of sample SMA-B28 could not be confirmed from the source map produced by Powertech. In addition, samples SMA-B27 and -B29 contained concentrations of natural uranium (U-nat), Pb-210, and Th-230 at concentrations exceeding three times background, also meeting observed release criteria. Table 7 summarizes the surface soil sample analytical results.

TABLE 7

RADIOLOGICAL DATA FROM SURFACE SOIL SAMPLES DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE 2012

Sample ID	Sample Date	Ra-226 (pCi/g)	U-nat (pCi/g)	Pb-210 (pCi/g)	Th-230 (pCi/g)
SMA-B01(background)	9/24/2007	0.9	1.2	0.6	0.5
SMA-B03	9/24/2007	**1.5**	-	-	-
SMA-B04	9/24/2007	1.0	-	-	-
SMA-B07	9/24/2007	**3.2**	-	-	-
SMA-B09	9/24/2007	**1.2**	-	-	-
SMA-B10	9/25/2007	**1.4**	-	-	-
SMA-B11	9/24/2007	**2.3**	-	-	-
SMA-B13	9/25/2007	**1.7**	-	-	-
SMA-B14	9/24/2007	**1.4**	-	-	-
SMA-B15	9/24/2007	**1.6**	-	-	-
SMA-B16	9/24/2007	0.8	-	-	-
SMA-B17	9/24/2007	0.9	-	-	-
SMA-B18	9/25/2007	0.5	-	-	-
SMA-B19	9/24/2007	**1.2**	-	-	-
SMA-B20	9/27/2007	0.9	-	-	-
SMA-B21	9/24/2007	**1.4**	-	-	-
SMA-B22	9/24/2007	0.8	-	-	-
SMA-B23	9/24/2007	**2.7**	-	-	-
SMA-B24	9/24/2007	**1.3**	-	-	-
SMA-B25	9/24/2007	**1.1**	-	-	-
SMA-B26	9/28/2007	**11**	-	-	-
SMA-B27	9/28/2007	**40**	**67**	30	**30**
SMA-B28	9/29/2007	**6.4**	-	-	-
SMA-B29	9/28/2007	**29**	**16**	20	**20**
SMA-B30	9/28/2007	**34**	-	-	-
SCDM Cancer Risk (ingestion)		**1.0**	**3.7***	**NE**	**3.0**
UMTRCA Standard for Surface Soil		**5.0**	**30***	**NE**	**NE**

Source: Powertech 2009

Notes:

Bold result indicates a concentration that exceeds the SCDM or UMTRCA benchmark.
Shaded result indicates a concentration that exceeds three times the background level.

*	Uranium-238 concentration
-	Not analyzed
ID	Identification
NA	Not applicable
NE	Not established
Pb-210	Lead-210
pCi/g	Picocuries per gram
Ra-226	Radium-226
SCDM	Superfund Chemical Data Matrix
Th-230	Thorium-230
UMTRCA	Uranium Mill Tailings Radiation Control Act
U-nat	Natural uranium

Powertech conducted baseline radiological surveys and sampling in the area of the Site between August 2007 and July 2008 to characterize and quantify radiation levels and radionuclide concentrations in soils. Within the surface mine area, external gamma exposure rates ranged from 5.9 to 324 microroentgens per hour (μR/hr). Elevated readings were associated with the abandoned open pit mines, waste rock, and drainages in the surface mine area (Powertech 2009). Background external gamma exposure rates near the Site were approximately 5.0 μR/hr (USGS 1993). Gamma exposure rates within the area of the Site exceeded three times the background, meeting observed release criteria. Table 8 summarizes gamma exposure rates in surface soil in the mine area.

TABLE 8

EXTERNAL GAMMA EXPOSURE RATES IN SURFACE SOIL IN MINE AREA DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

2007-2008

Parameter	Gamma-Ray Count Rate (μR/hr)
Mean	13.8
Standard Deviation	18.4
Median	10.9
Minimum	5.9
Maximum	324.1
Background	**5.0***

Sources: Powertech 2009, USGS 1993

Notes:

* Approximate
μR/hr Microroentgens per hour

5.4 AIR

The following sections address air sampling and analytical results from air sampling.

5.4.1 Air Sampling

Powertech conducted air monitoring and sampling within the area of the Site during three monitoring periods: August 18, 2007 to February 4, 2008; February 4 to May 17, 2008; and May 17 to July 17, 2008. Ambient exposure rates were measured by use of thermo luminescent dosimeters (TLD) placed at eight locations throughout the Dewey-Burdock site; however, five of the TLDs deployed were lost due to suspected disturbance by livestock in the area.

In addition, Radtrak passive track etch detectors were placed at each of those air monitoring locations, and at an additional eight biased locations to measure radon-222 (Rn-222) concentrations in air. The measurement events were separated into four quarterly periods as follows: August 14 to September 27, 2007; September 27, 2007, to February 1 through 12, 2008; February 1 through 12, 2008, to May 17, 2008; and May 17 to July 17, 2008 (Powertech 2009).

5.4.2 Air Sampling Results Summary

The associated annualized dose rates ranged from 114 to 323 mrem/yr. Typical ranges of average worldwide exposures are 60 to 160 mrem/yr (Powertech 2009).

Ambient radon monitoring results were as follows: Period 1 concentrations ranged from 1.0 to 9.8 pCi/L, with an average of 2.4 pCi/L; Period 2 concentrations ranged from 0.4 to 1.8 pCi/L, with an average of 1.2 pCi/L; Period 3 concentrations ranged from 0.4 to 3.3 pCi/L, with an average of 1.8 pCi/L; Period 4 concentrations ranged from 0.5 to 0.8 pCi/L, with an average of 0.5 pCi/L. In terms of effluent limits, the measured values exceeded the 10 *Code of Federal Regulations* (CFR) Part 20 limit of 0.1 pCi/L for Rn-222 with daughters present (Powertech 2009).

6.0 SOURCES OF CONTAMINATION AND WASTE CHARACTERISTICS

The source areas at the Site were geo-referenced to establish an approximate boundary and area of the four mine waste piles within the site boundary (see Figure 8). Waste Pile #1 (approximately 941,651.45 ft^2) is near the Triangle Mine Pit in the northwest portion of the site. Waste Pile #2 (approximately 11,037.49 ft^2) is 0.25 mile east of Pile #1. Waste Pile #3 (approximately 1,372,012.21 ft^2) is in the north central portion of the site. Waste Pile #4 (approximately 8,552,514.66 ft^2) is near the Darrow Mine Pit in the southeast portion of the site. The combined area of the waste piles is approximately10,877,215 ft^2 (see Figure 8). Radionuclides are the contaminants of concern, including natural uranium, Ra-226, Th-230, and Pb-210. Natural uranium is uranium containing the following relative concentrations of isotopes found in nature: uranium-235 (0.7 %), uranium-238 (99.3 %), and uranium-234 (trace amounts) (NRC 2014b). These radionuclides are present across the area of the Site, and migration of these off site into nearby surface water bodies has been documented. Surface soil samples near the open pits and mine waste piles have contained significantly elevated concentrations of radionuclides, exceeding UMTRCA standards and three times background concentrations.

Uranium, radium, and radon are naturally occurring. Chronic (long-term) inhalation exposure to uranium and radon in humans has been linked to respiratory effects such as chronic lung disease, while radium exposure has resulted in acute leukopenia, anemia, necrosis of the jaw, and other effects. Cancer is the

major effect of concern from exposure to radium via oral exposure, which is known to cause bone, head, and nasal passage tumors in humans. Uranium may cause lung cancer and tumors in lymphatic and hematopoietic tissues (EPA 2000).

7.0 PATHWAY ANALYSIS

This section discusses contaminant migration pathways evaluated under the HRS. A CERCLA Eligibility Checklist (Appendix B) and a Potential Hazardous Waste Preliminary Assessment Form (Appendix C) have been completed for the PA. Additionally, site risks and pathways of concern have been presented in a Conceptual Site Model (Appendix D).

7.1 GROUNDWATER PATHWAY AND TARGETS

Radiological results from samples indicate that groundwater in the area of the Site contains concentrations of radionuclides that exceed MCLs for uranium, Ra-226, and gross alpha. In addition, some wells contain concentrations of lead and arsenic that exceed the EPA action level for lead and MCL for arsenic. The majority of the samples exceeding these standards were collected from the Inyan Kara Group aquifer. This aquifer ranges from 250 to 500 feet thick and contains two subaquifers—the Fall River aquifer and Chilson aquifer—which are separated by the Fuson Shale. Data from aquifer pumping tests indicate a hydraulic connection between the Lakota and Fall River Formations through the intervening Fuson Shale in the Burdock area (NRC 2012). Samples collected from the alluvial aquifer in the area of the Site have also contained elevated concentrations of radionuclides. Minor aquifers also occur within the Black Hills, including the Sundance/Unkpapa, Newcastle, and alluvial aquifers. These minor aquifers yield small volumes of water locally for domestic and stock uses. Alluvial aquifers with thicknesses of 0 to 50 feet are along Beaver Creek, Pass Creek, and the Cheyenne River. They are typically unconfined, but may be confined locally. Alluvial aquifers are separated from the underlying Fall River Formation by the low-permeability Graneros Group confining unit. An alluvial drilling program completed in 2012 did not indicate any areas of discharge to the alluvium along Beaver Creek and Pass Creek from the underlying Fall River aquifer (NRC 2012).

Groundwater in the Fall River and Chilson aquifers flows from northeast to southwest. Regionally, groundwater flows radially outward from the Black Hills toward the surrounding plains (NRC 2012). The Site is not within a wellhead protection area (South Dakota Department of Environment and Natural Resources [SDDENR] 2013).

According to a well inventory of the area of the Site conducted by Powertech, the following water wells are within a 4-mile TDL of the Site boundary (see Figure 9): one domestic well and five stock wells are

within the Site boundary; one domestic well is within 0.25 mile of the Site; one domestic well and four stock wells are within 0.25 and 0.50 mile of the Site; one domestic well and six stock wells are within 0.50 and 1 mile of the Site; 12 Stock wells are within 1 to 2 miles of the Site; eight domestic wells, 10 Stock wells, and one irrigation well are within 2 to 3 miles of the Site; and six domestic and 10 stock wells are within 3 to 4 miles of the Site. The Site is on the border of Custer and Fall River Counties; the average persons per household in Custer County is 2.17, and the average persons per household in Fall River County is 2.12. Based on the number of domestic wells and the average number of persons per household, approximately 15 people could obtain their water from private wells in Custer County within the 4-mile TDL. Approximately 23 people could obtain their water from private wells in Fall River County within the 4-mile TDL. Table 9 summarizes the drinking water target population in the area of the Site. This estimated population differs slightly from the data obtained for the 2010 census, which indicated fewer (approximately 29) people live within 4 miles of the approximate center of the Site (Mable/Geocorr12: Geographic Correspondence Engine with Census 2010 Geography [Mable/Geocorr] 2014).

TABLE 9

DRINKING WATER TARGET POPULATION
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

Distance From Site	Number of Wells Within TDL	Population Served
On Site	1	2.12
0 to .25 mile	1	2.12
0.25 to 0.5 mile	1	2.17
0.5 to 1 mile	1	2.12
1 mile to 2 miles	0	0
2 miles to 3 miles	8	16.96
3 miles to 4 miles	6	13.02
Total	18	38.51

Source: Mable/Geocorr 2014

Notes:

TDL Target distance limit

7.2 SURFACE WATER PATHWAY AND TARGETS

Hydrology associated with the Site is discussed in Section 4.2. The primary surface water bodies associated with the 15-mile TDL are Pass Creek, Beaver Creek, and the Cheyenne River (see Figure 8).

According to SDDENR, no potable water intakes are on Pass Creek, Beaver Creek, or the Cheyenne River within the 15-mile TDL. Beaver Creek and the Cheyenne River are used by recreational anglers;

however, documentation of the extent of use of the water bodies as fisheries is not available. All surface water bodies within the 15-mile TDL are used for fish and wildlife propagation, recreation, and stock watering. Pass Creek has been designated for irrigation use; however, because the stream is intermittent, insufficient data are available to determine whether Pass Creek actually has been used for irrigation. Beaver Creek, from its headwaters to the Cheyenne River, has been determined to be impaired or threatened due to potential impacts of detrimental specific conductance, total dissolved solids, and salinity in these waters on warm water semi-permanent fish life, fish and wildlife propagation, recreation, stock watering, and irrigation. In addition, the Cheyenne River, between its confluence with Beaver Creek and Cascade Creek, has also been found to present threats to fish and wildlife propagation, recreation, stock watering, irrigation, and warm water semi-permanent fish life because of detrimental specific conductance, total dissolved solids, total suspended solids, and salinity in those waters stemming from runoff from nearby livestock grazing areas, feeding operations, and/or crop production (SDDENR 2012b).

Wetlands have been identified within the area of the Site and downstream of the Site along Pass Creek within the 15-mile TDL. The wetlands within the area of the Site are primarily designated as Palustrine Emergent (PEM) or Palustrine Unconsolidated Shore (PUS), with modifiers identifying the wetlands as seasonally or temporarily flooded and excavated or diked/impounded features. In addition, the Triangle Mine Pit area includes a Palustrine Unconsolidated Bottom (PUB) intermittently exposed excavated feature. Downstream from the Site along Pass Creek are Palustrine Aquatic Bed (PAB) and PEM wetlands that are semi-permanently flooded (U.S. Fish and Wildlife Service [USFWS] 2014). The wetlands within the area of the Site do not meet actual shoreline (frontage) qualifications to be evaluated for HRS scoring (EPA 2013).

The segment of Beaver Creek downstream of its confluence with Pass Creek does not contain identified wetlands until its confluence with the Cheyenne River, where Riverine Lower Perennial Unconsolidated Bottom semi-permanently flooded (R2UBF) and Palustrine Emergent temporarily flooded (PEMA) wetlands exist. Along the Cheyenne River, classified wetlands include Riverine Lower Perennial Unconsolidated Shore temporarily flooded (R2USA), seasonally flooded (R2USC), R2UBF, and PEMA (USFWS 2014). PEMA wetlands on the Cheyenne River approximately 1.7 miles downstream of its confluence with Beaver Creek include approximately 0.23 mile of contiguous frontage, meeting eligibility requirements and size criteria to be evaluated for HRS scoring. Additional PEMA wetlands on the Cheyenne River occur approximately 2.9 miles downstream of its confluence with Beaver Creek, where approximately 0.14 mile of contiguous frontage exists, also meeting eligibility requirements and size criteria to be evaluated for HRS scoring. Other R2USA and R2USC wetlands are present along the

Cheyenne River; however, additional information is needed to determine whether these wetlands have been impacted by the Site. The previous downstream sample location on the Cheyenne River was outside of the 15-mile TDL; therefore, data from that location cannot be used to evaluate attribution of contamination to the Site for HRS scoring purposes (EPA 2014).

Threatened and endangered species known or likely to occur in Custer and Fall River Counties are listed in Table 10. Powertech conducted surveys of the proposed PAA (including the area of the Site), including a 1-mile perimeter of the area, for threatened and endangered species, bald eagle winter roosts, all nesting raptors, upland game bird leks, and big game. In addition to the surveys, incidental observations of all vertebrate wildlife species within the PAA were recorded during each site visit during the year-long baseline survey period. Surveys were also conducted within the PAA for other vertebrate species of concern tracked by the South Dakota National Heritage Program (SDNHP), as well as bats, small mammals, lagomorphs, prairie dog colonies, breeding birds, predators, and herptiles (reptiles and amphibians). All the surveys were conducted by qualified biologists using standard field equipment and appropriate field guides. The black-footed ferret and the greater sage-grouse are the only federally listed species known to occur in both Custer and Fall River Counties. No federally listed vertebrate species were documented within the project survey area. Surveys for the black-footed ferret were not required for this project due to a block-clearance issued by the USFWS that includes the entire PAA and vicinity. The only exception to that clearance is in Custer State Park in northern Custer County. Surveys were also conducted by TVA in the general vicinity of the PAA during fall 1977. No ferrets or evidence of their presence were observed during those historical surveys (Powertech 2009). The following federally listed threatened and endangered species listed in Table 10 possibly occur in the two counties or possibly migrate through the counties (USFWS 2013).

TABLE 10

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

Common Name	Scientific Name	Status
Whooping Crane	Grus americana	Endangered
Red knot	Calidris canutus rufa	Proposed threatened
Sprague's pipit	Anthus spragueii	Candidate
Black-footed ferret	Mustela nigripes	Endangered
Northern Long-Eared Bat	Myotic septentrionalis	Proposed Endangered
Greater sage-grouse	Centrocercus urophasianus	Candidate

Source: U.S. Fish & Wildlife Service 2013

The State of South Dakota has listed 23 vertebrate species as threatened or endangered. Only one of the species listed was documented within the PAA or 1-mile perimeter during the survey period (mid-July 2007 through early August 2008). One active bald eagle nest was observed within the northwestern portion of the revised permit area (SW ¼, Section 30, Township 6 South, Range 1 East). The nest was in a cottonwood tree along Beaver Creek, and reportedly fledged one young in 2008. The bald eagle was removed from the Federal List of Endangered and Threatened Wildlife on August 8, 2007. However, protection provided to the bald eagle under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act has continued after the species was delisted. The rule change does not affect the bald eagle's status as a threatened or endangered species under state laws, or suspend any other legal protections provided by state laws. In South Dakota, the bald eagle is still considered a threatened species. Bald eagles were repeatedly observed along Beaver Creek in the western portion of the PPA and perimeter during winter roost surveys in late 2007 and early 2008.

7.3 SOIL EXPOSURE AND AIR PATHWAYS AND TARGETS

Standards have been developed for cleanup of radiation-contaminated soil under UMTRCA of 1978 (40 CFR Part 192). The purpose of these standards was to limit risk from inhalation of radon decay products in houses built on mine tailings, and to limit gamma radiation exposure to people using contaminated land. UMTRCA specifies two cleanup standards based on concentrations of Ra-226: (1) surface soil cleanup to 5 pCi/g, and (2) subsurface soil cleanup to 15 pCi/g. An EPA memorandum dated February 12, 1998, clarifies use of these two UMTRCA soil cleanup standards for CERCLA sites (EPA 1998). The surface soil standard of 5 pCi/g for Ra-226 is a health-based standard developed to control the hazard from gamma radiation; therefore, this standard may be appropriate and relevant to CERCLA sites.

Air samples collected within the Site area contained concentrations of Ra-226 that exceeded the 10 CFR Part 20 limit of 0.1 pCi/L for Rn-222 with daughters present (Powertech 2009).

The land within the Site is privately owned and leased. Land use is primarily agricultural and for livestock grazing. Edgemont, the town nearest the Site (approximately 13 miles away), had an estimated population of 774 people in 2010 (U.S. Census 2010). The area surrounding the Site is primarily agricultural. Residents and people farming surrounding land are potential targets. Nobody resides within 200 feet of the Site. No residents are within 1 mile of the Site, and approximately 26 persons reside within the 4-mile TDL (Mable/Geocorr 2014). No daycare centers or schools are within 200 feet of the Site.

8.0 DATA GAPS

Most of the data reviewed for this PA were acquired and reported during the period of approximately 2006 to 2009. Some significant data gaps exist within the information reported. For the PA, source areas were estimated by tracing boundaries of waste piles and surface impoundments by reference to two-dimensional aerial imagery. Soil samples collected by Powertech within the area of the Site (Surface Mine Area [SMA-XX]) were all analyzed for Ra-226. However, of the 25 samples collected, only three were analyzed for additional radionuclides including uranium, Pb-210, and Th-230—the other known contaminants on site. Groundwater samples were collected within the area of the Site from various types of wells; however, lack of groundwater sampling data from near and upgradient of the Site limited availability of reliable background concentrations. Surface water samples were collected from multiple water bodies in the area of the Site, including Pass Creek, Beaver Creek, and the Cheyenne River. However, the downstream Pass Creek surface water sample location was upstream of the probable point of entry (PPE) for surface water migrating from the Site. Additionally, the downstream sample location on the Cheyenne River was beyond the 15-mile TDL (see Figure 8). Therefore, data acquired at that sample point could not be used to evaluate potential surface water impacts from the Site in this PA. Biological samples including fish were collected by Powertech to evaluate potential impacts on surface water bodies including Beaver Creek and the Cheyenne River. Beaver Creek and the Cheyenne River are used by recreational anglers; however, documentation of the extent of use of the water bodies as fisheries is not available. Uranium was detected in all fish collected during July 2008. The detections were interpreted to be the result of increased sample sizes of the species submitted for laboratory analysis. No detections of uranium occurred in samples collected during April 2008; however, the detection limit was higher during that sampling period due to matrix interferences. Pb-210, Th-230, and Ra-226 were detected, but at low concentrations in most samples. Pb-210 was detected in one specimen collected at the downstream Beaver Creek location; however, the precision of the result was questionable due to matrix interferences. Additional data are needed to determine whether the Site is impacting fish in water bodies downstream of the Site.

9.0 SUMMARY

The Site (EPA ID: SDN000803095) is 15 miles from Edgemont, in Custer and Fall River Counties, South Dakota. Geographic coordinates at the approximate center of the Site are 43.478486 degrees north latitude and 103.962746 degrees west longitude. The 1,426-acre Site is used primarily for cattle grazing. ISR is proposed as a possible future use of this site.

Sources

By reference to aerial imagery, approximate areas of mine waste piles were quantified. Surface soil near the mine waste piles has been determined to contain levels of radionuclides exceeding health-based benchmarks and exceeding three times background concentrations, meeting observed release criteria. Additionally, samples collected from impoundments within the area of the Site have contained elevated levels of radionuclides and could also be considered potential source areas for HRS evaluation. Radionuclides are the contaminants of concern, including uranium, Ra-226, Th-230, and Pb-210.

Groundwater Migration Pathway

Sampling results indicate an observed release to groundwater has occurred at the Site. According to results of groundwater sampling and a well inventory conducted by Powertech, 18 domestic wells are within a 4-mile radius of the site boundary. Wells 16 and 42 have contained concentrations of Ra-226 exceeding its MCL and meeting observed release criteria. Concentrations in other wells have been above background levels but have not met observed release criteria; therefore, those wells are subject to potential contamination.

Surface Water Migration Pathway

Sampling results indicate a release of radionuclides has occurred to Pass Creek, Beaver Creek, and the Cheyenne River. There are no known drinking water intakes within the 15-mile TDL. The Cheyenne River and Beaver Creek support fish life and possible food chain targets; however, the extent of use of the water bodies as fisheries is not available. Freshwater emergent and riverine wetlands are present along the riparian areas at the confluence of Beaver Creek and the Cheyenne River and downstream (along the Cheyenne River); however, it is unknown whether these sensitive environments have been impacted by releases from the site. Additional data are needed to properly evaluate the surface water pathway and confirm attribution to contaminants present at the Site.

Soil Exposure and Air Migration Pathways

Surface soil samples collected at the Site have contained elevated concentrations of radionuclides. Additionally, air samples have indicated elevated concentrations of Rn-222 within the area of the Site. However, because of the small number of targets in the immediate vicinity of the Site, those pathways pose limited threat to human health and the environment.

Conclusions

Additional surface soil sampling within the Site appears warranted to better characterize and define source areas. Additional data could be used to quantify source materials within the area of the Site, and volumes of waste piles should be measured more accurately. Additional sampling of surface water and

sediment also appears warranted to determine if releases from the Site are impacting downstream sensitive environments (i.e., wetlands and possible fish habitat).

9.1 EMERGENCY RESPONSE AND REMOVAL ACTION CONSIDERATIONS

Based on available data from previous site assessments by Powertech, a removal action appears warranted to address radium-226 contamination in mine waste piles at the Site. Five soil samples collected from the Site contained radium-226 concentrations that exceeded the EPA health-based standard of 5 pCi/g and exceeded three times background concentrations. Emergency response actions do not appear warranted at the Site.

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FIGURES

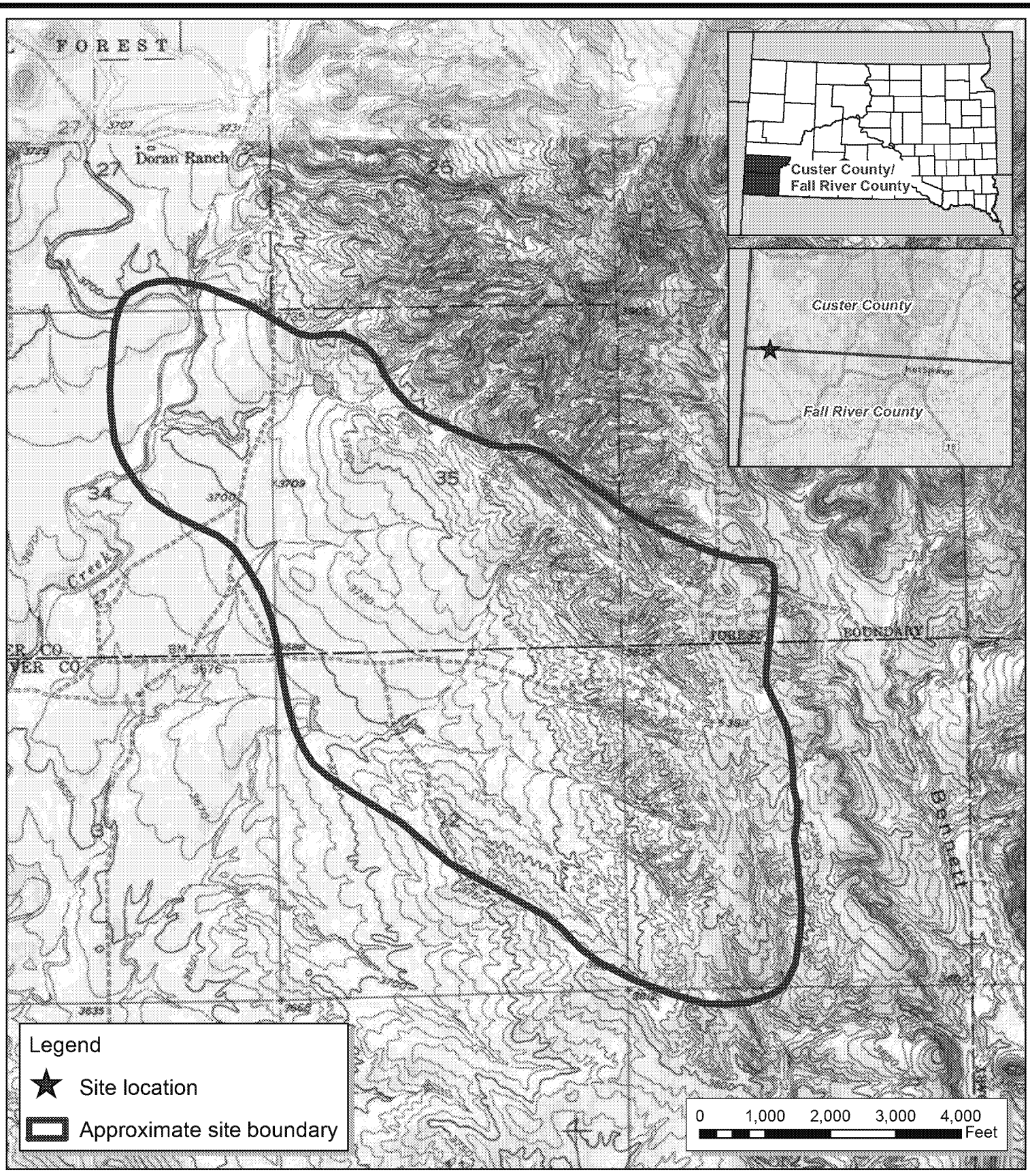

Figure 1
Site Location Map

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Source: ArcGIS Online, World Imagery, 2011

Date: May 2014

Project No: EPS81105.0014

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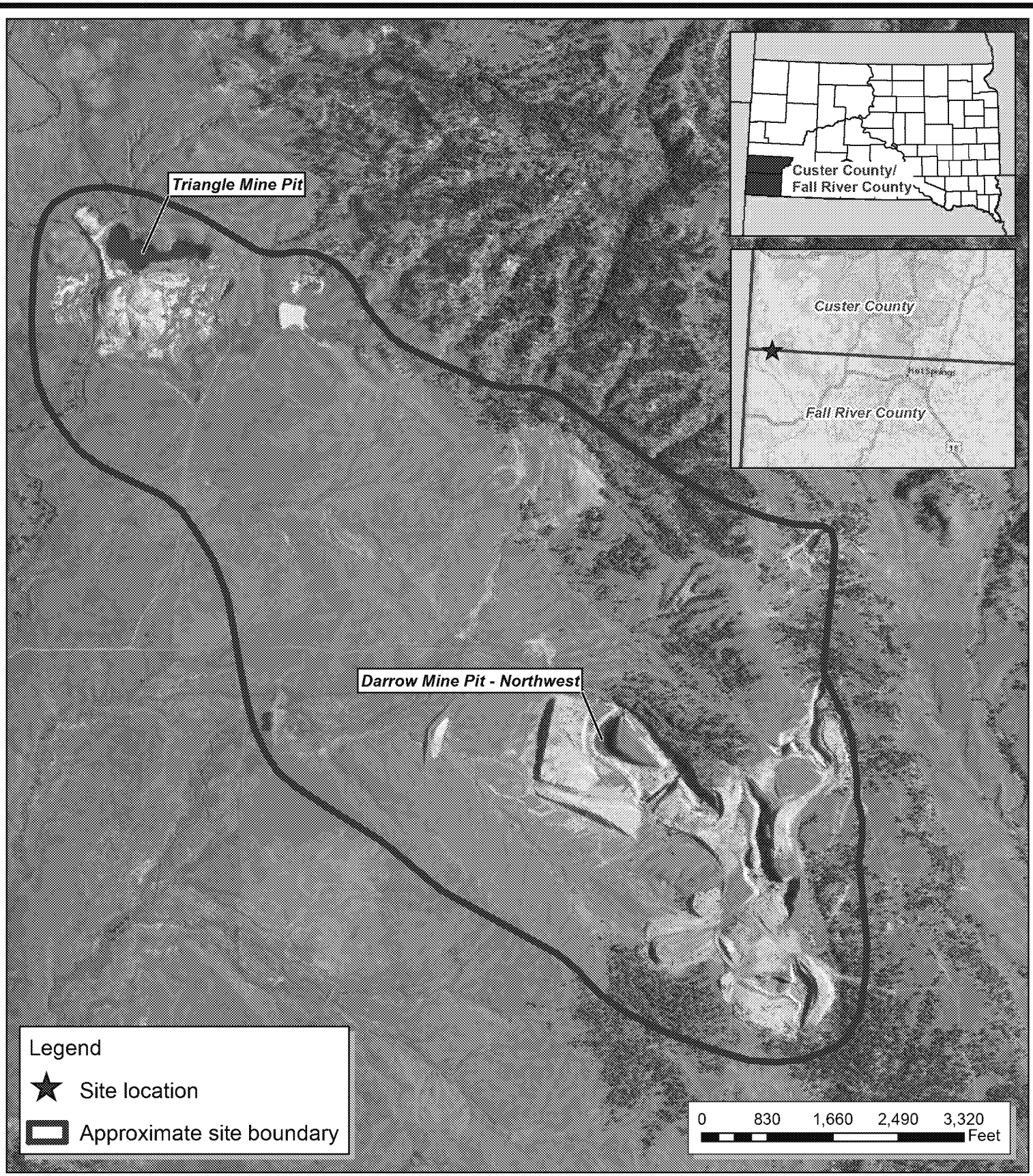

Figure 2
Site Layout Map

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Source: ArcGIS Online, World Imagery, 2011

Date: May 2014

Project No: EPS81105.0014

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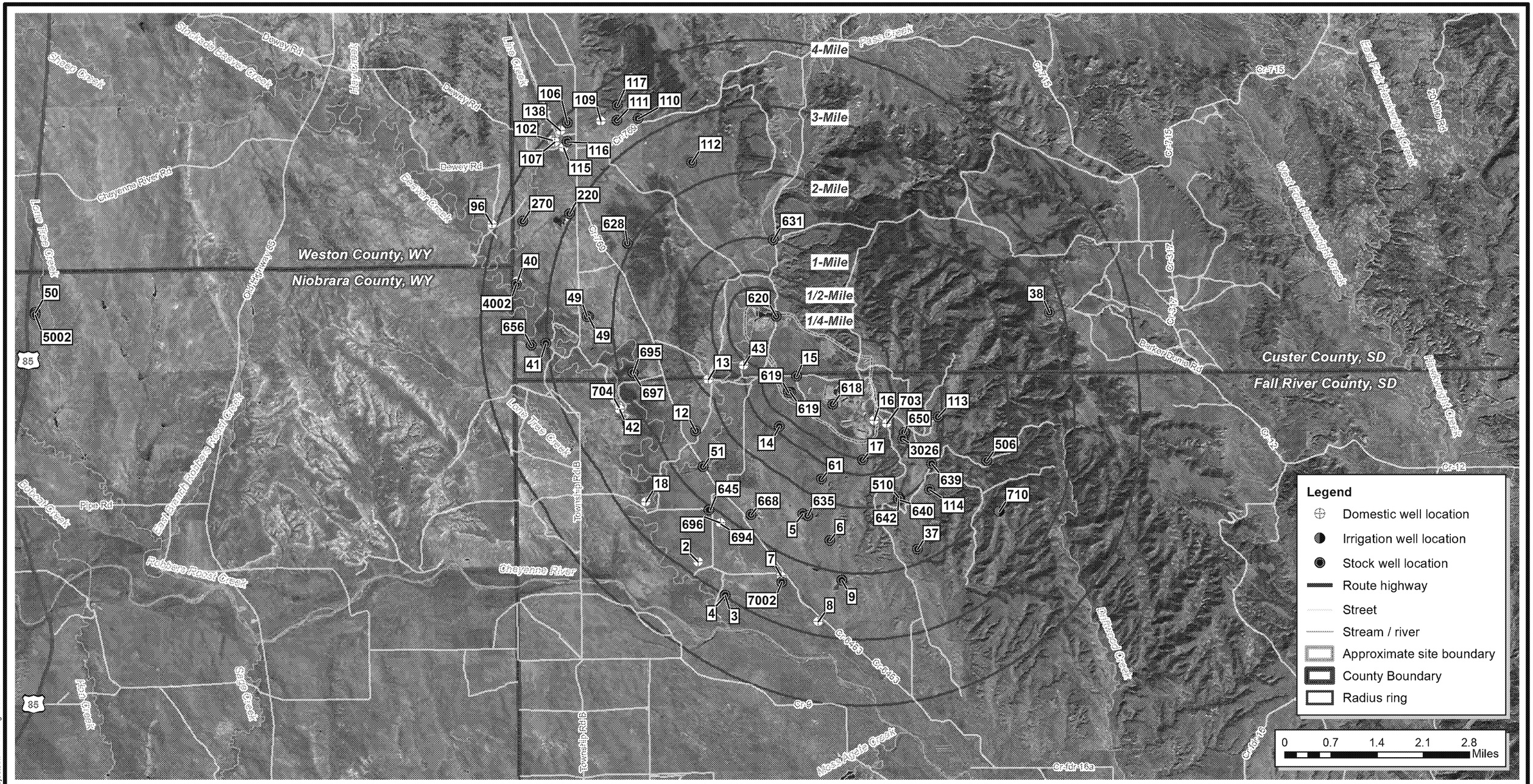

Figure 3
4-Mile Radius Well Locations

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Date: May 2014

Source: ArcGIS Online, World Imagery, 2011; ESRI Data Maps, 2007; HSIP Gold, 2007; Powertech, Inc, 2012.

Project No: EPS81105.0014

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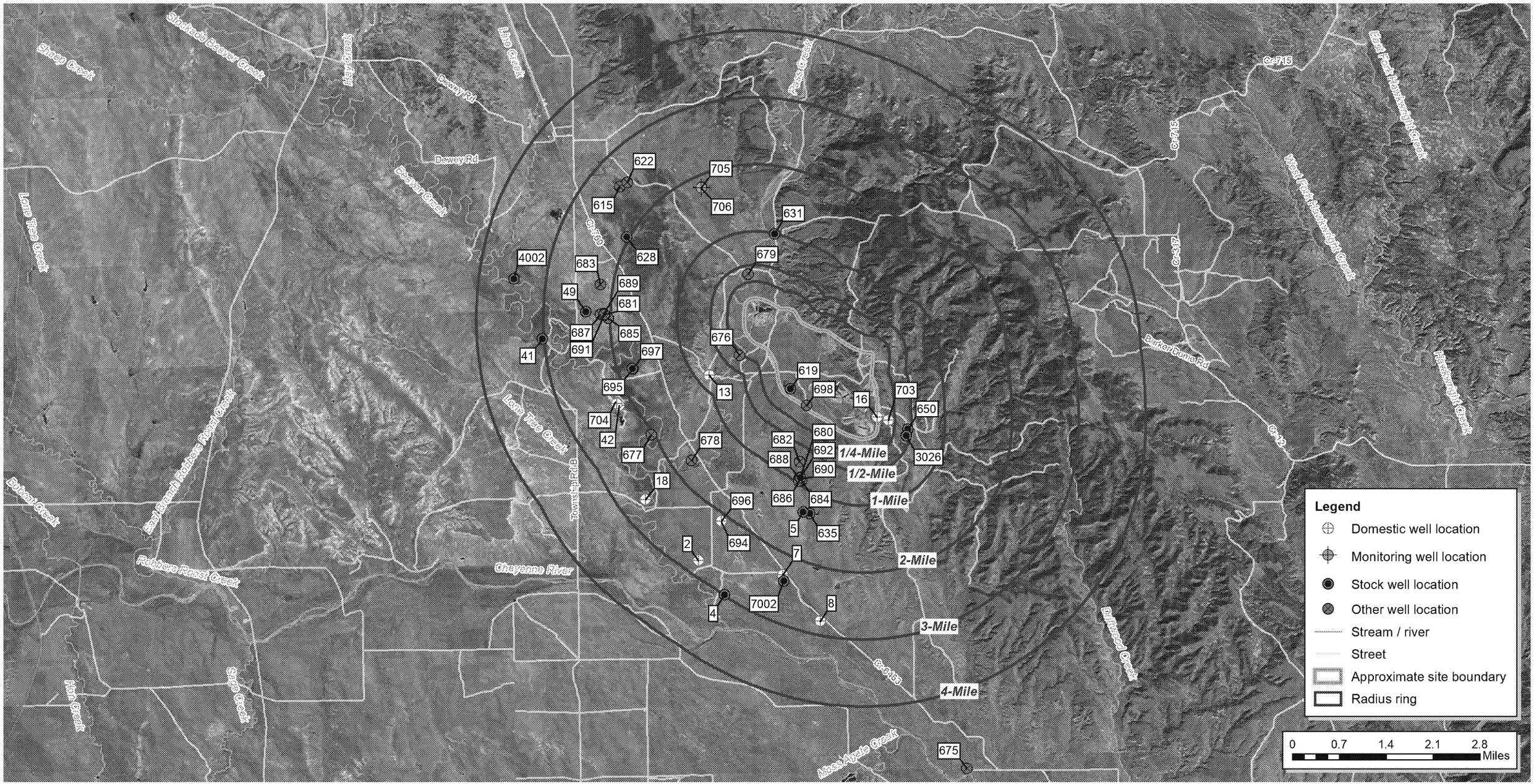

Figure 4
Groundwater Sample Location Map

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Date: May 2014 | Source: ArcGIS Online, World Imagery, 2011; ESRI Data Maps, 2007; HSIP Gold, 2007; Powertech, Inc, 2009 | Project No: EPS81105.0014

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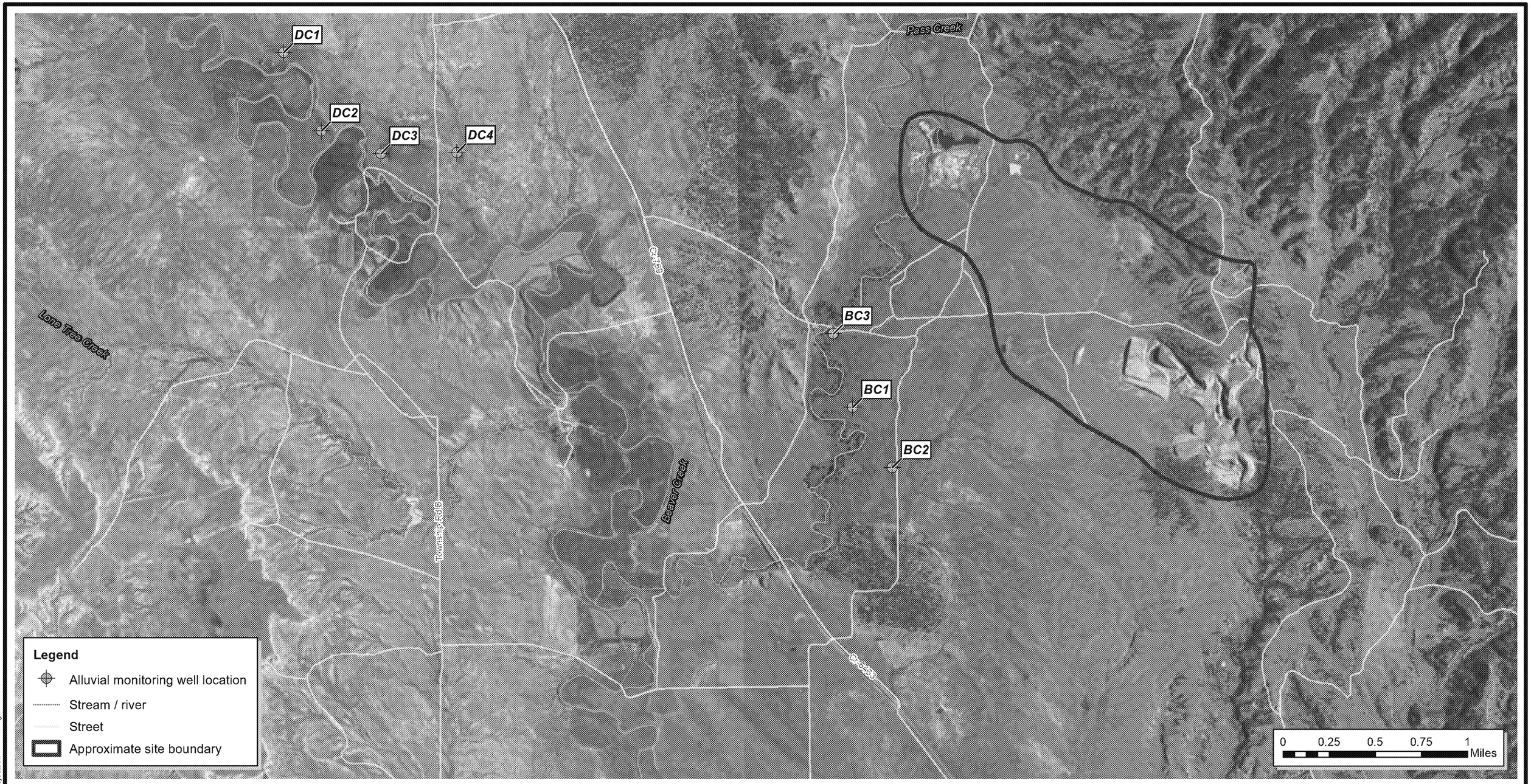

Figure 5
Alluvial Monitoring Well Locations

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

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Date: May 2014 | Source: ESRI, ArcGIS Online World Imagery, 2011; ESRI Data Maps, 2007; HSIP Gold, 2007 | Project No: EPS81105.0014

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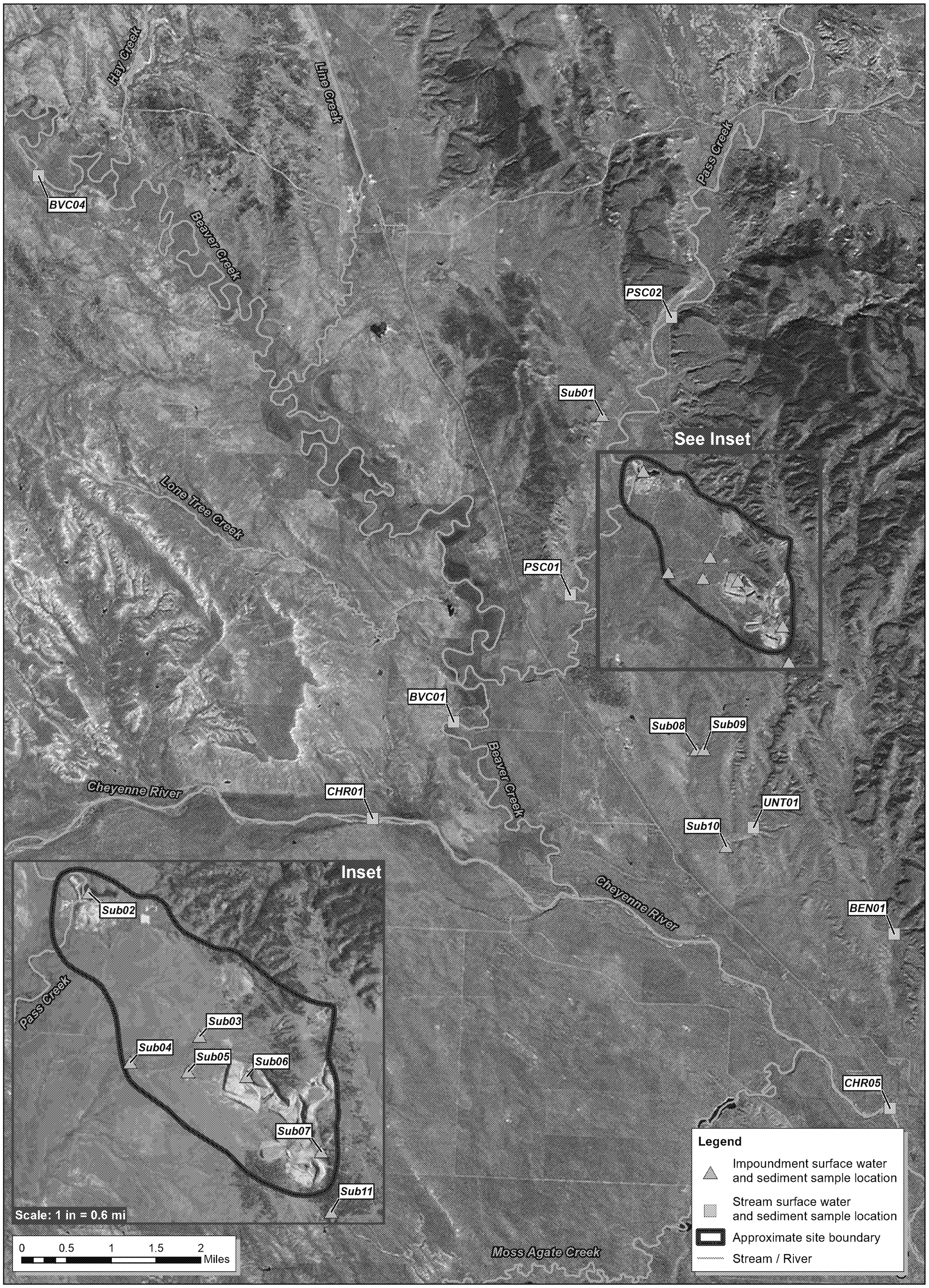

Figure 6

Surface Water and Sediment Sample Locations (Powertech 2008)

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Date: May 2014 | Source: ArcGIS Online, World Imagery, 2011; NHDPlus, 2013, Powertech, Inc, 2008 | Project No: EPS81105.0014

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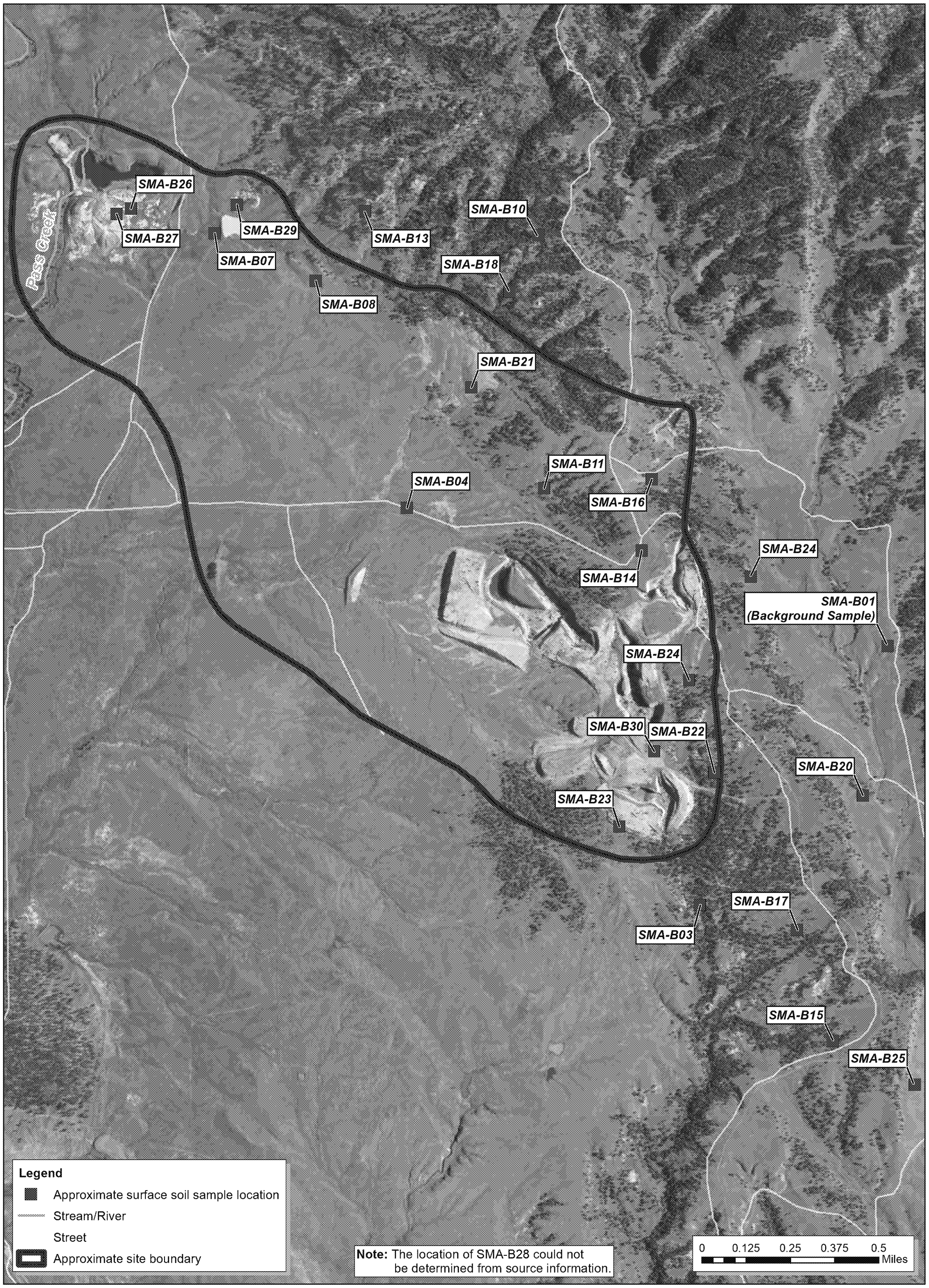

Figure 7

Approximate Surface Soil Sample Locations

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

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Seagull Environmental Technologies, Inc.

Date: May 2014 | Source: ArcGIS Online, World Imagery, 2010; HSIP Gold, 2007; Powertech, 2009 | Project No: EPS81105.0014

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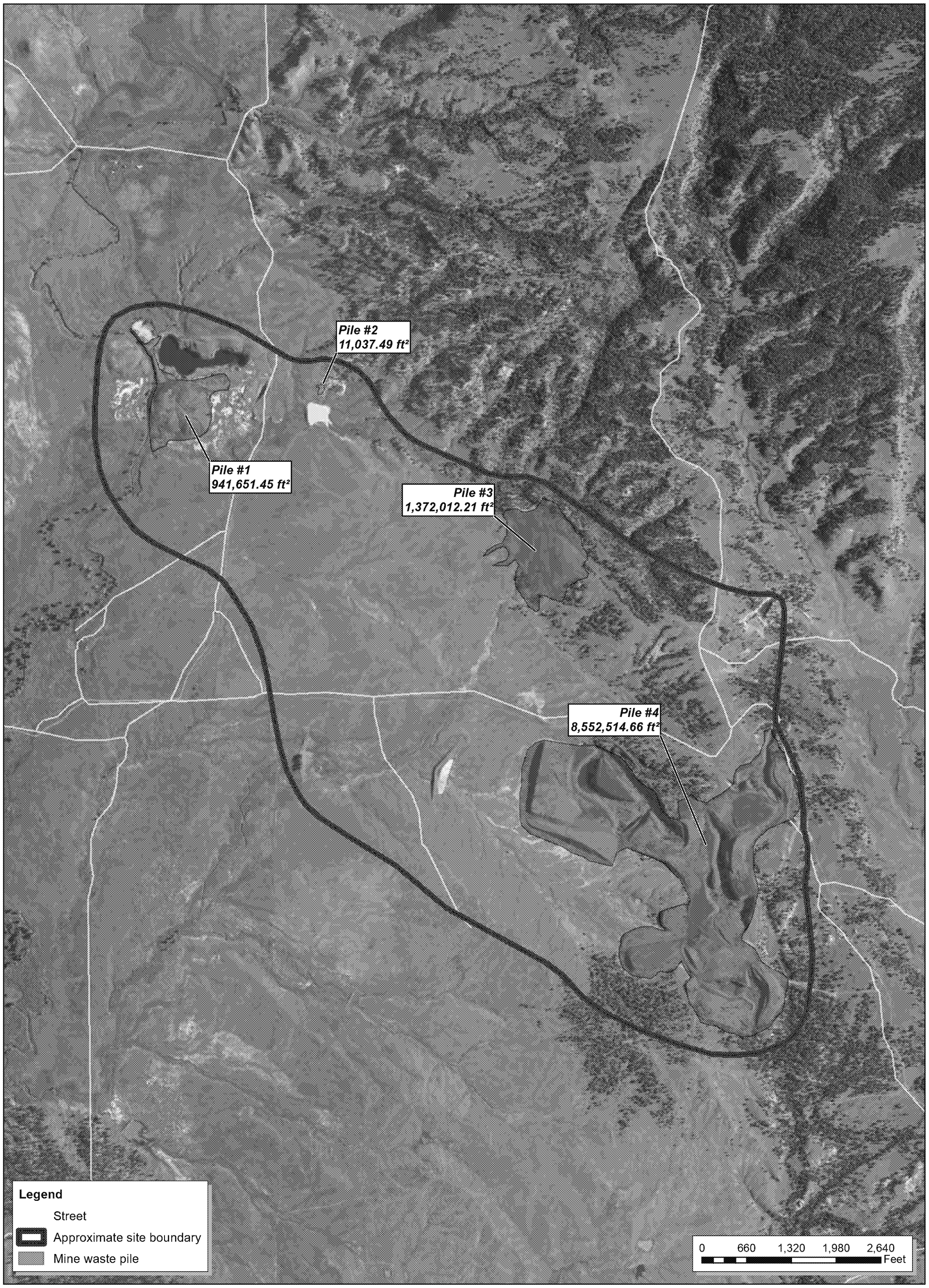

Figure 8
Approximate Source Area Boundaries

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

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Seagull Environmental Technologies, Inc.

Date: May 2014 | Source: ArcGIS Online, World Imagery, 2010; HSIP Gold, 2007; Powertech, 2009 | Project No: EPS81105.0014

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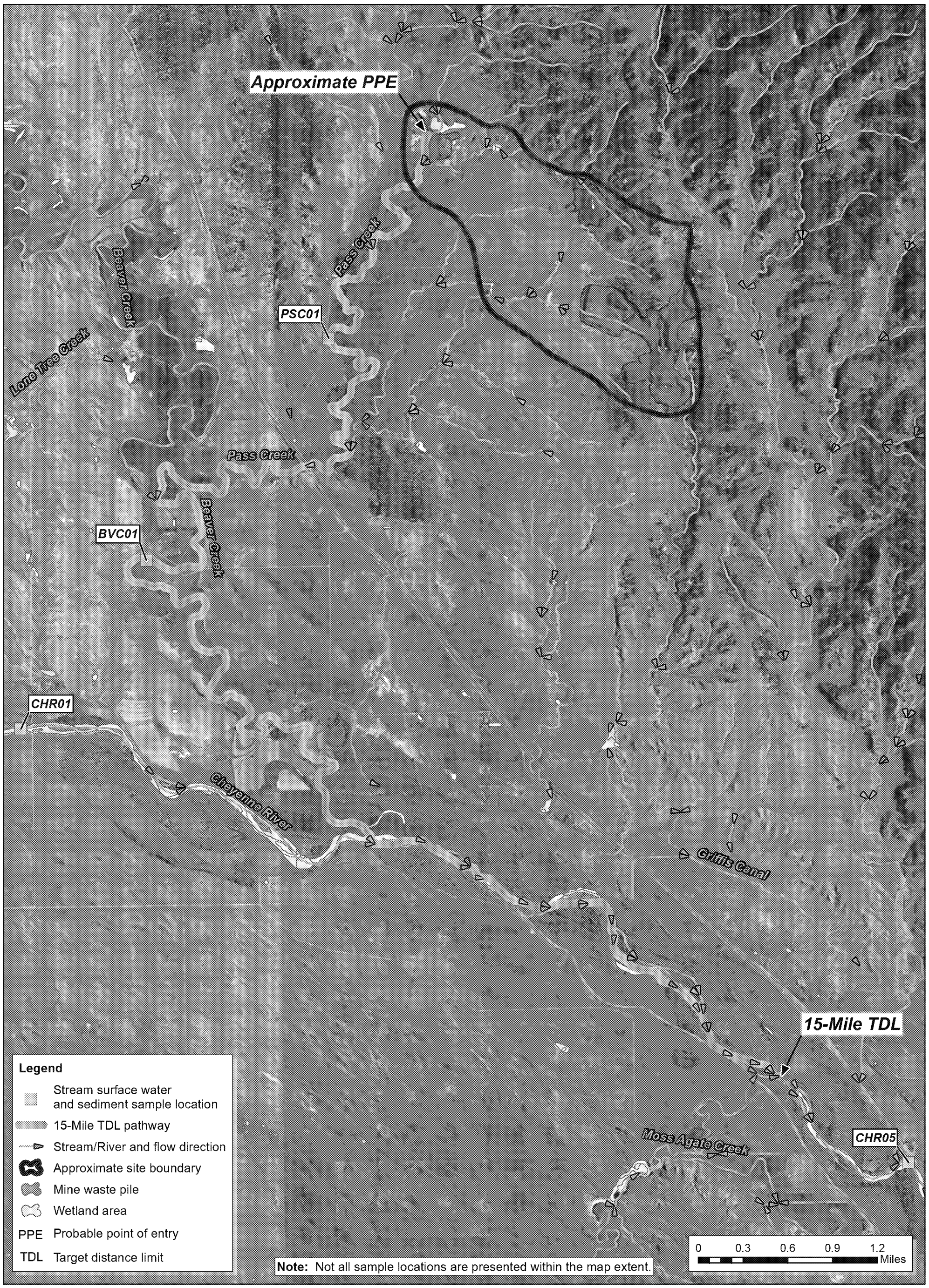

Figure 9

15-Mile Target Distance Limit and Surface Water Sample Locations

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

N W E S

Date: May 2014 Source: ArcGIS Online, World Imagery, 2010; USGS, NHDPlus, 2013; USFWS, NWI, 2013 Project No: EPS81105.0014

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APPENDIX A

SITE RECONNAISSANCE REPORT

Seagull Environmental Technologies, Inc.

3555 Chase Street
Wheat Ridge, Colorado 80212
www.seagullenvirotech.com

May 2, 2014

Victor Ketellapper, Site Assessment Team Leader
U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Site Reconnaissance Report regarding the Darrow/Freezeout/Triangle Uranium Mine Site, near Edgemont, Custer and Fall River Counties, South Dakota
EPA Region 8 START 8(a) Carve-Out Contract EP-S8-11-05, Task Order #0014
Task Monitor: Victor Ketellapper, Site Assessment Team Leader

Dear Mr. Ketellapper

Seagull Environmental Technologies, Inc. (Seagull) is pleased to submit this Site Reconnaissance Report regarding the Darrow/Freezeout/Triangle Uranium Mine site near Edgemont, Custer and Fall River Counties, South Dakota. If you have any questions or comments, please contact the Project Manager via email at gdillon@seagullenvirotech.com or by phone at (816) 412-1953.

Sincerely,

Gregory R. Dillon
Task Order Project Manager

Hieu Q. Vu, PE
Program Manager

Enclosures

PRELIMINARY ASSESSMENT REPORT

Regarding the

DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

NEAR EDGEMONT, SOUTH DAKOTA

EPA ID: SDN000803095

Contract No.: EP-S8-11-05
Task Order No.: 0014

Prepared By:

SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.
3555 CHASE STREET
WHEAT RIDGE, COLORADO 80202-1129

May 2, 2014

SITE RECONNAISSANCE REPORT
Darrow/Freezeout/Triangle Uranium Mine Site

DATE/TIME: November 5, 2013, 08:00-17:00.

WEATHER CONDITIONS: Cloudy, snow and rain mixture, calm wind ~26° degrees Fahrenheit (°F).

PARTICIPANTS/AFFILIATION: Gregory Dillon and Jon DeBruine of Seagull Environmental Technologies, Inc.

1.0 INTRODUCTION

Under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Carve-Out 8(a) Contract (No. EP-S8-11-05), Task Order No. 0014, Seagull Environmental Technologies, Inc. (Seagull) has been tasked to conduct a Preliminary Assessment (PA) for the Darrow/Freezeout/Triangle Uranium Mine (Site) site near Edgemont, Custer and Fall River Counties, South Dakota. As part of the PA, Seagull is submitting this Site Visit Report for activities conducted on November 5, 2013, at the Site. The site visit was conducted to locate previously identified source areas and potential sample locations, and to become familiar with the site layout. The Site is located approximately 13 miles northwest of Edgemont, South Dakota.

2.0 SITE DESCRIPTION

The Site encompasses approximately 1,426 acres and is located primarily on private land. Attempts to gain access to the Site area via letters to private landowners were unsuccessful. During the site reconnaissance, START team members Gregory Dillon and Jonathan DeBruine, and Maple Barnard and Valois Shea of EPA traveled along public roads in the site vicinity in an attempt to attain a vantage point of the Site area. However, the public access roads were inadequate to gain a view of the Site.

Photos of the site area, including drainage areas, historical points of interest, and current conditions of the surrounding area were taken during the site reconnaissance. START and EPA visited Edgemont City Hall to meet with local officials to discuss the purpose of the PA and to obtain information for the report. Following the meeting with local officials, Mr. Mike Koopman, City Engineer/Code Administrator, accompanied START and EPA to visit areas of interest in and around Edgemont. The Edgemont, South Dakota, Uranium Mill Tailings Repository and former mill location were visited during the site reconnaissance. In addition, current City of Edgemont Public Water Supply (PWS) wells were visited to document and confirm their locations.

3.0 AREA DESCRIPTION

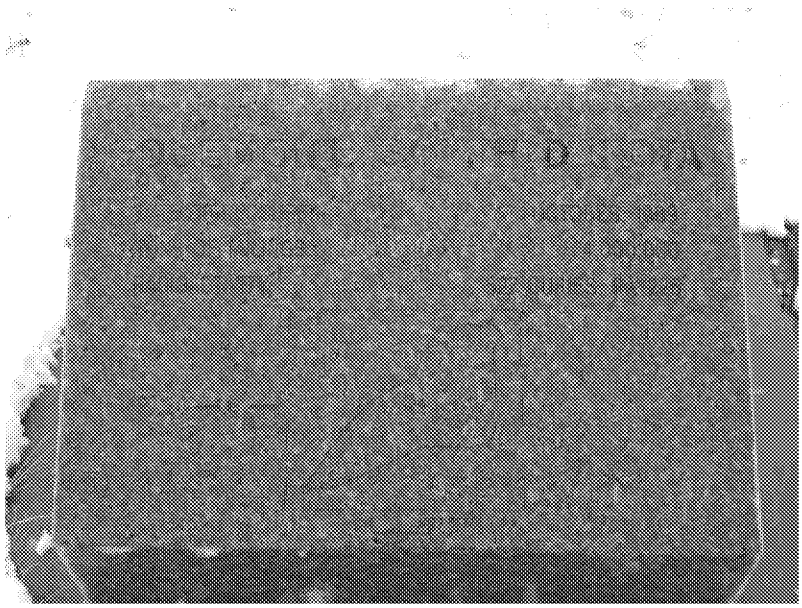
The Site is located in Custer and Fall River Counties in the Great Plains physiographic province on the edge of the Black Hills uplift. Land use in the area is primarily agricultural range land for livestock. Surface water from the site drains into tributaries of Pass Creek and Beaver Creek, eventually flowing into the Cheyenne River.

4.0 PHOTOGRAPHIC DOCUMENTATION:

Photographs documenting the site visit are included in Appendix A.

APPENDIX A

PHOTOGRAPHIC DOCUMENTATION



Client: U.S. Environmental Protection Agency	Description: Photograph of the geographic marker at the Edgemont, South Dakota, Uranium Mill Tailings Repository.	Photograph Number: 1
Direction: N/A	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of no trespassing signage at the Edgemont, South Dakota, Uranium Mill Tailings Repository.	Photograph Number: 2
Direction: East	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of City of Edgemont Municipal Well #2 southwest of town. It is currently an active well for the City's Public Water Supply (PWS).	Photograph Number: 3
Direction: North	Photographer: Jon DeBruine	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of City of Edgemont Municipal Well #4 southwest of town. It is currently an active well for the City's PWS.	Photograph Number: 4
Direction: East	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of an overflow outfall of a City PWS basin and stormwater in the Edgemont City Park. The pond is used for recreational fishing seasonally.	Photograph Number: 5
Direction: South	Photographer: Jon DeBruine	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of signage at the boundary of the Black Hills National Forest taken from County Road 16.	Photograph Number: 6
Direction: Northeast	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of Pass Creek at crossing of County Highway 6463.	Photograph Number: 7
Direction: Southwest	Photographer: Gregory Dillon	Date: 11/5/2013

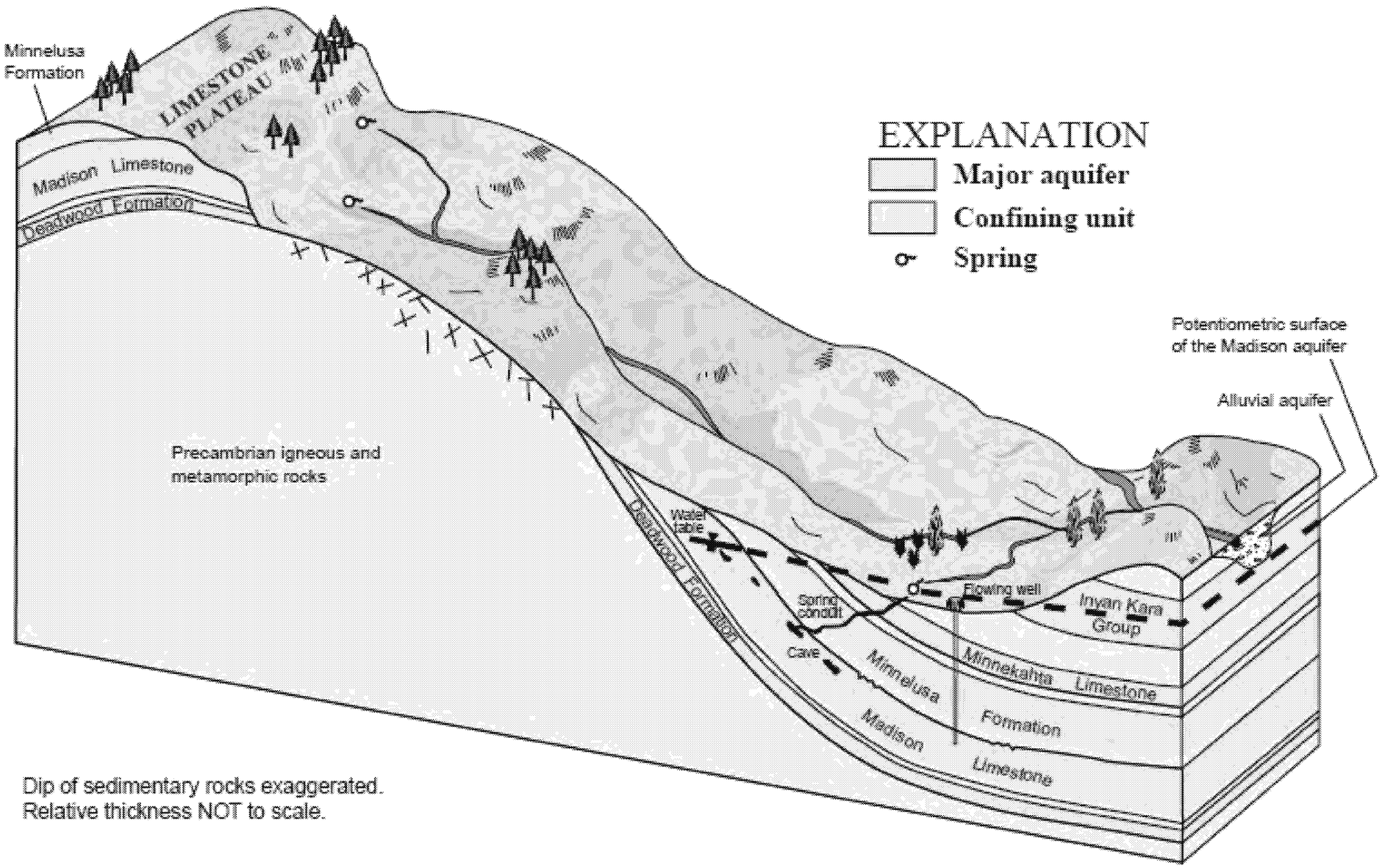
Client: U.S. Environmental Protection Agency	Description: Photograph of Pass Creek at crossing of County Highway 6463.	Photograph Number: 8
Direction: Northeast	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of the Cheyenne River at the approximate 15-mile Target Distance Limit (TDL).	Photograph Number: 9
Direction: West	Photographer: Gregory Dillon	Date: 11/5/2013

Client: U.S. Environmental Protection Agency	Description: Photograph of the Cheyenne River at the approximate 15-mile TDL.	Photograph Number: 10
Direction: South	Photographer: Gregory Dillon	Date: 11/5/2013

APPENDIX B

DIAGRAM OF HYDROGEOLOGY OF BLACK HILLS AREA



Simplified Hydrogeologic Setting of the Black Hills Area

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.

Date: May 2014 | Source: Driscoll, et al. (2002) | Project No: EPS81105.0014

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APPENDIX C

CERCLA ELIGIBILITY CHECKLIST

CERCLA Eligibility Checklist

Site Name: Darrow/Freezeout/Triangle Uranium Mine
Alias: _____
City: near Edgemont **State** South Dakota **Zip code** 57735
EPA ID Number *(Note - This may be a RCRA or other program ID)*: SDN000803095

Note: The site is automatically CERCLA eligible if it is a federally owned or operated RCRA site.

I. CERCLA Authority	Y	N
A. Is the release or threat of release a result of naturally occurring substances in its unaltered form, or altered solely through naturally occurring processes of phenomena, from a location where it is naturally found?		X
B. Is the release or threat of release a result of products that are part of the structure of, and result in exposure within, residential buildings or business or community structures?		X
C. Does the release or threat of release affect public or private drinking water supplies due to deterioration of the system through ordinary use?		X
If YES to A, B, or C, the EPA may not have authority to respond.		
If NO to A, B, or C, the EPA may have authority to respond.		

II. CERCLA Eligibility	Y	N
A. Has this site been previously entered into CERCLIS or is it part of, or adjacent to, an existing CERCLIS site?	X	
B. Is this site part of a National Priority List site?		X
C. Did the facility cease operations prior to November 19, 1980?		X
If YES to A, B, or C, then STOP. The facility is probably a CERCLA site.		
If NO, Continue		
1. RCRA Deferral Factors Did the facility file a RCRA Part A application?		
If YES: a. Does the facility currently have interim status?		
b. Did the facility withdraw its Part A application?		
c. Is the facility a known or possible protective filer? (e.g., filed in error, or never operated as TSDFs)		
d. Does the facility have a RCRA Part B Operating Permit or a post closure permit?		
e. Is the facility a late (after 11/19/80) or non-filer that has been identified by the EPA or the state? (i.e., facility did not know it needed to file under RCRA)		
If all answers to questions a, b, and c are NO, STOP. The facility is a CERCLA eligible site.		
If answer to b or c is YES, STOP. The facility is a CERCLA eligible site.		
If answer to b and c are NO and any other answer is YES, site is RCRA, continue to Part 2.		

CERCLA Eligibility Checklist

2. RCRA Sites Eligible for the NPL Type of facility: Generator____ Transporter___ Recycler_____ TSDF (Treatment/Storage/Disposal Facility)X		
a. Has the facility owner filed for bankruptcy under federal or state laws?		
b. Has the facility lost RCRA authorization to operate or shown probable unwillingness to carry out corrective actions?		
c. Is the facility a TSDF "converter," i.e., former TSF that did not pursue a RCRA operating permit and have changed status to "generator" or "non-handler"?		
d. Is the facility a non- or late filer?		
If answer to a, b, c, or d is YES, STOP. The facility is a CERCLA eligible site.		
D. Excluded Releases:		
1. Does the CERCLA Petroleum Exclusion apply (CERCLA section 101 (13))?		
2. Does the facility have discharges of CERCLA hazardous substances that are in compliance with federally permitted releases as described in CERCLA section 101 (10)?		
3. Does the facility have a release or threat of release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against their employer as described in CERCLA section 101 (22)?		
4. Does the facility have a release or threat of release which results from emissions from engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine as described in CERCLA section 101 (22)?		
5. Does the facility have a release or threat of release which results from source, byproduct or special nuclear material from a nuclear incident subject to section 170 of the Atomic Energy Act; or from any processing site specifically designated under the Uranium Mill Tailings Radiation Control Act of 1978 as described in CERCLA section 101 (22)?		
6. Does the facility have a release or threat of release which results from the normal application of fertilizer?		
If answer to 1, 2, 3, 4, 5, or 6 is YES, the facility is NOT CERCLA eligible.		
If NO, the facility may be CERCLA eligible. (If unknown, answer NO). Please list hazardous substances here. .		

CERCLA Eligibility Checklist

III. Other programs: The site may never reach the NPL or be a candidate for removal. We need to be able to refer it to any other programs in EPA or state agencies which may have jurisdiction, and thus be able to affect a cleanup. Responses should summarize available information pertaining to the question. Include information in existing files in these programs as part of the PA. Answer all that apply.		
A. Is there an owner or operator?		
B. NPDES-CWA: Is there a discharge water containing pollutants with surface water through a point source (pipe, ditch, channel, conduit, etc.)?		
C. CWA (404): Have fill or dredged material been deposited in a wetland or on the banks of a stream? Is there evidence of heavy equipment operating in ponds, streams or wetlands?		
D. UIC-SDWA: Are fluids being disposed of to the subsurface through a well, cesspool, septic system, pit, etc.?		
E. TSCA: Is it suspected that there are PCB's on the site which came from a source with greater than 50 ppm PCB's such as oil from electrical transformers or capacitors?		
F. FIFRA: Is there a suspected release of pesticides from a pesticide storage site? Are there pesticide containers on site?		
G. RCRA (D): Is there an owner or operator who is obligated to manage solid waste storage or disposal units under state solid waste or groundwater protection regulations?		
H. UST: Is it suspected that there is a leaking underground storage tank containing a product which is a hazardous substance or petroleum?		
I. Brownfields: Is there redevelopment/revitalization interest		

Is the site eligible for an assessment under CERCLA authority? Please circle: Yes or No

Site Determination:

Is this site a valid site or incident? Please Circle and explain below

YES or NO

☐ **Enter the site into CERCLIS. Further assessment is recommended (explain below)**

☐ **The site is not recommended for placement into CERCLIS (explain below)**

DECISION/DISCUSSION/RATIONALE:

CERCLA Eligibility Checklist

Regional EPA Reviewer:_____ **Date:**_____

State Agency Reviewer:_____ **Date:**_____

APPENDIX D

POTENTIAL HAZARDOUS WASTE PRELIMINARY ASSESSMENT FORM

OMB Approval Number: 2050-0095
Approved for Use Through: 1/92

EPA Potential Hazardous Waste Site Preliminary Assessment Form

Identification
SDN000803095

State SD	Site Number SDN000803095

CERCLIS Discovery Date: March 15, 2013

1. General Site Information

Name: Darrow/Freezeout/Triangle Uranium Mine	Street Address: 13 miles NNW of Edgemont				
City: near Edgemont	State: SD	Zip Code: 57735	County: Custer and Fall River	Co. Code 21 and 27	Cong. Dist: 30
Latitude: 43.478486 Longitude:-103.962746	Approximate Area of Site: 1,426 Acres _____ Square Miles		Status of Site: ☐ Active ☐ Not Specified X Inactive ☐ NA		

2. Owner/Operator Information

Owner: Not Applicable (NA)			Operator:		
Street Address:			Street Address:		
City:			City:		
State:	Zip Code:	Telephone	State:	Zip Code:	Telephone

Type of Ownership:
- ☐ Private
- ☐ Federal Agency
  Name _____
- ☐ State
- ☐ Indian
- ☐ County
- ☐ Municipal
- ☐ Not Specified
- ☐ Other _

How Initially Identified:
- ☐ Citizen Complaint
- ☐ PA Petition
- ☐ State/Local Program
- ☐ RCRA, CERCLA Notification
- ☐ Federal Program
- ☐ Incidental
- ☐ Not Specified
- ☐ Other _____

3. Site Evaluator Information

Name of Evaluator: Gregory R. Dillon	Agency/Organization: Seagull Environmental Technologies, Inc.	Date Prepared: 04/29/2014
Street Address: 3555 Chase Street	City: Wheat Ridge	State: Colorado
Name of EPA or State Agency Contact: Victor Ketellapper (EPA)	Street Address: 1595 Wynkoop Street	
City: Denver	State: Colorado	Telephone: 303-312-6578

4. Site Disposition (for EPA use only)

Emergency Response/Removal Assessment Recommendation: ☐ Yes ☐ No Date _____	CERCLIS Recommendation: ☐ Higher Priority SI ☐ Lower Priority SI ☐ NFRAP ☐ RCRA ☐ Other _____ ☐ Date _____	Signature: Name (typed): Position:

EPA **Potential Hazardous Waste Site**

Preliminary Assessment Form - Page 2 of 4

CERCLIS Number:

SDN000803095

5. *General Site Characteristics*

Predominant Land Uses Within One Mile of Site (Check all that apply):

- ☐ Industrial
- ☐ Commercial
- ☐ Residential
- X Forest/Fields
- X Agricultural
- X Mining
- ☐ DOD
- ☐ DOE
- ☐ DOI
- ☐ Other Federal Facility _____
- ☐ Other _____

Site Setting:

- ☐ Urban
- ☐ Suburban
- X Rural

Years of Operation:

Beginning Year 1952

Ending Year 1994

☐ Unknown

Type of Site Operations (Check all that apply):

- ☐ Manufacturing (must check subcategory)
  - ☐ Lumber and Wood Products
  - ☐ Inorganic Chemicals
  - ☐ Plastic and/or Rubber Products
  - ☐ Paints, Varnishes
  - ☐ Industrial Organic Chemicals
  - ☐ Agricultural Chemicals (e.g., pesticides, fertilizers)
  - X Miscellaneous Chemical Products (e.g., adhesives, explosives, ink)
  - ☐ Primary Metals
  - ☐ Metal Coating, Plating, Engraving
  - ☐ Metal Forging, Stamping
  - ☐ Fabricated Structural Metal Products
  - ☐ Electronic Equipment
  - ☐ Other Manufacturing
- X Mining
- X Metals
- ☐ Coal
- ☐ Oil and Gas
- X Non-metallic Minerals
- ☐ Retail
- ☐ Recycling
- ☐ Junk/Salvage Yard
- ☐ Municipal Landfill
- ☐ Other Landfill
- ☐ DOD
- ☐ DOE
- ☐ DOI
- ☐ Other Federal Facility _____
- ☐ RCRA
- ☐ Treatment, Storage, or Disposal
- ☐ Large Quantity Generator
- ☐ Small Quantity Generator
- ☐ Subtitle D
- ☐ Municipal
- ☐ Industrial
- ☐ Converter
- ☐ Protective Filer
- ☐ Non- or Late Filer
- ☐ Not Specified
- ☐ Other _____

Waste Generated:

- ☐ On site
- ☐ Off-site
- X On site and off-site

Waste Deposition Authorized By:*

- ☐ Present Owner
- X Former Owner
- ☐ Present & Former Owner
- ☐ Unauthorized
- ☐ Custer County Roads & Bridges

Waste Accessible to the Public:*

- ☐ Yes
- X No (on site) Unknown if off-site disposal is accessible to public.

Distance to Nearest Dwelling, School, or Workplace:

> 200 Feet

6. *Waste Characteristics Information*

Source Type: (Check all that apply)	Source Waste Quantity: (Include units)	Tier*:
☐ Landfill		
☐ Surface Impoundment		
☐ Drums		
☐ Tanks and Non-Drum Containers		
☐ Chemical Waste Pile		
☐ Scrap Metal or Junk Pile		
X Tailings Pile	10,877,215.81 ft^2	A
☐ Trash Pile (open dump)		
☐ Land Treatment		
☐ Contaminated Groundwater Plume (unidentified source)		
☐ Contaminated Surface Water/Sediment (unidentified source)		
☐ Contaminated Soil		
☐ Other_____		
☐ No Sources		

* C = Constituent W = Waste stream V = Volume A = Area

General Types of Waste (Check all that apply)

- ☐ Metals
- ☐ Organics
- X Inorganics
- ☐ Solvents
- ☐ Paints/Pigments
- ☐ Laboratory/Hospital Waste
- X Radioactive Waste
- ☐ Construction/Demolition Waste
- ☐ Pesticides/Herbicides
- ☐ Acids/Bases
- ☐ Oily Waste
- ☐ Municipal Waste
- ☐ Mining Waste
- ☐ Explosives
- ☐ Other _____

Physical State of Waste as Deposited (Check all that apply):*

- X Solid
- ☐ Liquid
- ☐ Sludge
- ☐ Gas
- ☐ Powder

EPA **Potential Hazardous Waste Site**

Preliminary Assessment Form - Page 3 of 4

CERCLIS Number:

SDN000803095

7. *Groundwater Pathway*

Is Groundwater Used for Drinking Water Within 4 Miles?

X Yes
☐ No

Type of Drinking Water Wells Within 4 Miles (Check all that apply):

☐ Municipal
X Private
☐ None

Is There a Suspected Release to Groundwater?

X Yes
☐ No

Have Primary Target Drinking Water Wells Been Identified?

X Yes
☐ No

If yes, Enter Primary Target Population: Approximately 4.24 individuals based on County average populations per household.

List Secondary Target Population Served by Groundwater Withdrawn From:

0 - ¼ Mile * 2.12
> ¼ - ½ Mile * 2.17
> ½ - 1 Mile * 2.12
> 1 - 2 Miles * 0
> 2 - 3 Miles * 14.84
> 3 - 4 Miles * 13.02

Total Within 4 Miles 34.27

Depth to Shallowest Aquifer:

0 to 50 feet below ground surface

Karst Terrain/Aquifer Present:

☐ Yes
X No

Nearest Designated Wellhead Protection Area:

☐ Underlies Site
☐ > 0 - 4 Miles
X None Within 4 Miles

8. *Surface Water Pathway*

Type of Surface Water Draining Site and 15 Miles Downstream (Check all that apply):

X Stream X River X Pond ☐ Lake
☐ Bay ☐ Ocean ☐ Other _____

Shortest Overland Distance From Any Source To Surface Water:*

< 100 Feet

_____ Miles

Is There a Suspected Release to Surface Water?

X Yes
☐ No
☐ Unknown

Site is Located in:

☐ Annual - 10-year Floodplain
X > 10-year - 100-year Floodplain
☐ > 100-year - 500-year Floodplain
☐ > 500-year Floodplain

Drinking Water Intakes Located Along the Surface Water Migration Path:

☐ Yes
X No

Have Primary Target Drinking Water Intakes Been Identified:

☐ Yes
X No

If Yes, Enter Population Served by Primary Target Intakes:

0 People

List All Secondary Target Drinking Water Intakes:

Name	Water Body	Flow (cfs)	Population Served

Fisheries Located Along the Surface Water Migration Path:

X Yes
☐ No

Have Primary Target Fisheries Been Identified:

X Yes
☐ No

List All Secondary Target Fisheries:

Water Body/Fishery Name	Flow (cfs)
Beaver Creek	9.9
Cheyenne River	23.0

EPA **Potential Hazardous Waste Site**
Preliminary Assessment Form - Page 4 of 4

CERCLIS Number:
SDN000803095

8. Surface Water Pathway (continued)

Wetlands Located Along the Surface Water Migration Path:
X Yes
☐ No
☐ Unknown

Have Primary Target Wetlands Been Identified:
☐ Yes
X No

List Secondary Target Wetlands:

Water Body	Flow (cfs)	Frontage Miles
Cheyenne River (PEMA) 23.0		0.23
Cheyenne River (R2USA) 23.0		0.74
Cheyenne River (R2USA) 23.0		0.27

Other Sensitive Environments Located Along the Surface Water Migration Path:
☐ Yes
X No

Have Primary Target Sensitive Environments Been Identified:
☐ Yes
X No

List Secondary Target Sensitive Environments:

Water Body	Flow (cfs)	Sensitive Environment Type

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare On or Within 200 Feet of Areas of Known or Suspected Contamination:*
☐ Yes
X No

If Yes, Enter Total Resident Population:

_____ People (part-time

Number of Workers On Site:*
X None
☐ 1 - 100
☐ 101 - 1,000
☐ >1,000

Have Terrestrial Sensitive Environments Been Identified On or Within 200 Feet of Areas of Known or Suspected Contamination?
☐ Yes
X No

If Yes, List Each Terrestrial Sensitive Environment:

10. Air Pathway

Is There a Suspected Release to Air:
☐ Yes
X No

Enter Total Population On or Within:

On Site	
0 – 1/4 Mile	
>1/4 – 1/2 Mile	
>1/2 Mile - 1 Mile	
>1 - 2 Miles	
>2 - 3 Miles	
>3 - 4 Miles	
Total Within 4 Miles	

Wetlands Located Within 4 Miles of the Site:
X Yes
☐ No
☐ Unknown

Other Sensitive Environments Located Within 4 Miles of the Site:*
☐ Yes
☐ No
X Unknown

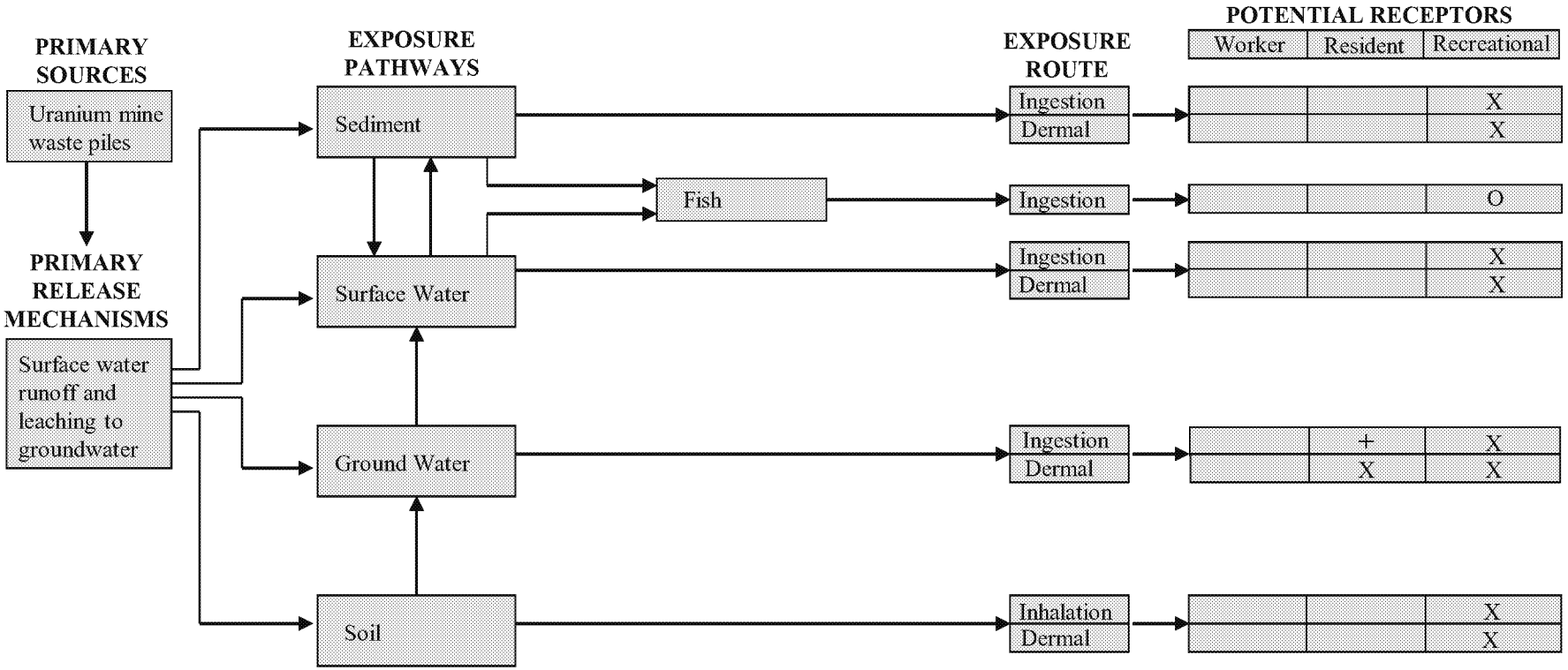
List All Sensitive Environments Within 1/2 Mile of the Site:

Distance	Sensitive Environment Type/Wetlands Area (acres)
On Site	
0 – 1/4 Mile	
> 1/4 - 1/2 Mile	

APPENDIX E

CONCEPTUAL SITE MODEL

SITE CONCEPTUAL MODEL
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
EDGEMONT, SOUTH DAKOTA



Legend

	No evaluation required.
O	Pathway is not complete.
X	Pathway is or might be complete but is judged to be minor.
+	Pathway is or might be complete and could be significant.

ATTACHMENT 7

ANALYTICAL SUMMARY REPORT

January 12, 2015

Oglala Sioux Tribe Natural Resource Reg Agency
W Hwy 18
Pine Ridge, SD 57770

Work Order: R14120184 Quote ID: R462

Project Name: Radiological

Energy Laboratories Inc. Rapid City SD received the following 1 sample for Oglala Sioux Tribe Natural Resource Reg Agency on 12/11/2014 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
R14120184-001	Cheyenne River/Red Shirt	12/11/14 10:35	12/11/14	Aqueous	Total Uranium Metals Digestion by EPA 200.2 Gross Alpha, Gross Beta

This report was prepared by Energy Laboratories, Inc., 2821 Plant St., Rapid City, SD 57702. As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By:

Linda K. Larson
Branch Manager

Digitally signed by
Linda Larson
Date: 2015.01.15 16:15:56 -07:00

CLIENT: Oglala Sioux Tribe Natural Resource Reg A
Project: Radiological
Work Order: R14120184

Report Date: 01/12/15

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002 and WY00937.

LABORATORY ANALYTICAL REPORT

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agency
Project: Radiological
Lab ID: R14120184-001
Client Sample ID: Cheyenne River/Red Shirt

Report Date: 01/12/15
Collection Date: 12/11/14 10:35
Date Received: 12/11/14
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
METALS								
Uranium	17	ug/L		1	30	1	E200.8	12/24/14 17:02/eli-ca
Uranium, Activity	11.7	pCi/L		0.7	20	1	E200.8	12/24/14 17:02/eli-ca
RADIONUCLIDES - TOTAL								
Gross Alpha	26.7	pCi/L	*		15	1	E900.0	12/24/14 12:34/eli-ca
Gross Alpha precision (±)	6.7	pCi/L				1	E900.0	12/24/14 12:34/eli-ca
Gross Alpha MDC	5.1	pCi/L				1	E900.0	12/24/14 12:34/eli-ca
Adjusted gross alpha is 15.0 pCi/L								

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
* - The result exceeds the MCL.

QA/QC Summary Report

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agenc
Report Date: 01/12/15
Project: Radiological
Work Order: R14120184

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**E200.8**								Analytical Run: SUB-C194664	
Lab ID:	**ICV**	Initial Calibration Verification Standard								12/24/14 14:51
Uranium		0.0475	mg/L	0.00030	95	90	110			
Method:	**E200.8**									Batch: C_43486
Lab ID:	**MB-43486**	Method Blank				Run: SUB-C194664				12/24/14 15:50
Uranium		4E-05	mg/L	1E-05						
Lab ID:	**LCS3-43486**	Laboratory Control Sample				Run: SUB-C194664				12/24/14 15:54
Uranium		0.50	mg/L	0.00030	99	85	115			
Lab ID:	**C14120456-001BMS3**	Sample Matrix Spike				Run: SUB-C194664				12/24/14 16:18
Uranium		0.54	mg/L	0.00030	108	70	130			
Lab ID:	**C14120456-001BMSD3**	Sample Matrix Spike Duplicate				Run: SUB-C194664				12/24/14 16:20
Uranium		0.55	mg/L	0.00030	110	70	130	2.2	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agenc
Report Date: 01/12/15
Project: Radiological
Work Order: R14120184

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0									Batch: C_GrDW-0658
Lab ID: Th230-GrDW-0658	Laboratory Control Sample				Run: SUB-C194686				12/24/14 12:34
Gross Alpha	140	pCi/L		120	80	120			
Lab ID: MB-GrDW-0658	Method Blank				Run: SUB-C194686				12/24/14 12:34
Gross Alpha	2	pCi/L							
Gross Alpha precision (±)	0.9	pCi/L							
Gross Alpha MDC	0.8	pCi/L							
Lab ID: C14120574-001BMS	Sample Matrix Spike				Run: SUB-C194686				12/24/14 12:34
Gross Alpha	100	pCi/L		80	70	130			
Lab ID: C14120574-001BMSD	Sample Matrix Spike Duplicate				Run: SUB-C194686				12/24/14 12:34
Gross Alpha	95	pCi/L		74	70	130	7.1	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.

Workorder Receipt Checklist

Oglala Sioux Tribe Natural Resource Reg Agency

R14120184

Login completed by: Steve Froiland
Date Received: 12/11/2014

Reviewed by: Linda Larson
Received by: sf

Reviewed Date: 1/8/2015
Carrier name: Hand Delivered

Shipping container/cooler in good condition?	Yes D	No D	Not Present O
Custody seals intact on all shipping container(s)/cooler(s)?	Yes D	No D	Not Present O
Custody seals intact on all sample bottles?	Yes D	No D	Not Present O
Chain of custody present?	Yes O	No D	
Chain of custody signed when relinquished and received?	Yes O	No D	
Chain of custody agrees with sample labels?	Yes O	No D	
Samples in proper container/bottle?	Yes O	No D	
Sample containers intact?	Yes O	No D	
Sufficient sample volume for indicated test?	Yes O	No D	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes O	No D	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes D	No O	NotApplicable D
Container/Temp Blank temperature:	21.4°C From Field		
Water - VOA vials have zero headspace?	Yes D	No D	No VOA vials submitted O
Water - pH acceptable upon receipt?	Yes O	No D	Not Applicable D

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Contact and Corrective Action Comments:

None

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page _____ of _____

Company Name:

Project Name, PWS, Permit, Etc.

Sample Origin
State:

EPA/State Compliance:
Yes O No O

Report Mail Address (Required):

Contact Name: Phone/Fax:

Cell:

Sampler: (Please Print)

CJ No Hard Copy Email:

Invoice Contact & Phone:

Purchase Order:

Quote/Bottle Order:

Invoice Address (Required):

CJ No Hard Copy Email:

Special Report/Fonnats:

O OW
O POTW/WWTP
O State:

O EDD/EDT(Electronic Data) Format:
O LEVEL IV

O Other:

O NELAC

Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page

RUSH

Comments:

Rllppecl by:

Coole<IO(s):

Rec tptT9111p

On Ice: y N

Custody Seal: y N

On Cooler Intact: y N

On Bottle Signature Match: y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Custody Record MUST be Signed

Relinquished by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:

Sample Disposal: Return to Client: Lab Disposal:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.

ATTACHMENT 8

Oglala Sioux Tribe
Office of the President
P.O. Box #2070
Pine Ridge, South Dakota 57770
1(605) 867-5821 Ext. 8420 (O) / 1(605) 867-6076 (F)

Julian Bear Runner

August 21, 2020

Valois Robinson
U.S. EPA Region 8
Mail Code: 8WD-SDU
1595 Wynkoop St.
Denver, CO 80202-1129
robinson.valois@epa.gov

Chip Kimball
Field Manager
South Dakota Field Office
U.S. Bureau of Land Management
309 Bonanza Street
Belle Fourche, SD 57717
lkimball@blm.gov

Re: Dewey-Burdock Uranium Mining Project

Dear Ms. Kimball and Ms. Robinson:

Please be advised that the Oglala Sioux Tribe is hereby requesting joint Government-to-Government consultations between the Environmental Protection Agency (EPA), Bureau of Land Management (BLM) and the Oglala Sioux Tribe pursuant to President Clinton's Executive Order No. 13175 and Oglala Sioux Tribal Council Ordinance No. 10-11 to discuss what impacts that the Dewey-Burdock In Situ Uranium Mining Project will have on in both the project area, and area surrounding the project area. The whole southern Black Hills area is part of the aboriginal homeland of the Oglala Sioux Tribe as recognized under Article 5 of the 1851 Fort Laramie Treaty and Article 2 of the 1868 Fort Laramie Treaty.

Please keep in mind that your agencies -- as part of the Federal Government -- are the trustee of the Oglala Sioux Tribe and must always act in the Tribe's best interest of the Tribe approving federally sanctioned energy projects like Dewey-Burdock Project. See *Covelo Indian Community v. FERC*, 895 F.2d 581 (9th Cir. 1990) (all government agencies have "fiduciary" responsibilities to tribes, and must always act in the interests of the beneficiaries); and *Blue Legs v. U.S. Bureau of Indian Affairs*, 867 F.2d 1094, 1100 (8th Cir. 1989) ("[t]he existence of a trust duty between the United States and an Indian or Indian tribe can

be inferred from the provisions of a statute, treaty or other agreement, reinforced by the undisputed existence of a general trust relationship between the United States and the Indian people").

The Tribe would like to jointly consult with Bureau of Land Management (BLM) and the Environmental Protection Agency (EPA) all aspects of the Dewey-Burdock Project, and highlight the following items for Bureau of Land Management's and Environmental Protection Agency's attention.

1. Impact on historic and cultural resources (including rock features);
2. Impact on water quality and contamination of both ground and surface waters;
3. Impact of injection wells;
4. Impact on tribal treaty rights (including hunting and fishing rights);
5. Impact of reservation agriculture+.
6. Removal of uranium tailings from past mining operations;
7. Impact of storage, interim treatment, shipments, and disposal of radioactive wastes;
8. Other concerns or issues of the Tribe and its members

The Tribe requests that your two agencies invite all other 1868 Treaty tribes to the consultations and include any concerns they may have regarding the project. This includes tribal officials and THPOs.

The Tribe also requests that Bureau of Land Management (BLM) confer and coordinate with Environmental Protection Agency (EPA) to ensure ongoing federal consultations with the Tribe are carried out in accordance with the procedures attached on the agenda already exchanged between the EPA and Oglala Sioux Tribe. We look forward to setting a schedule for the consultations at a time mutually agreed upon by the EPA, BLM and the Tribe, taking into consideration the protections we must all take to address the ongoing pandemic.

The Tribe's contact person regarding the joint consultations is Ms. Jennifer Spotted Bear, telephone number 605- 867-8468.

Mr. Julian Bear Runner
OST Tribal President

cc: Jennifer Spotted Bear, OST Secretary
Chancy Wilson, OST Land Committee, Chairman
Barbara Yellow Hair, OST Land Committee, Secretary
Russell Zephier, OST Attorney
Mario Gonzalez, OST Attorney

ATTACHMENT 9

PROGRAMMATIC AGREEMENT
AMONG
U.S. NUCLEAR REGULATORY COMMISSION
U.S. BUREAU OF LAND MANAGEMENT
SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE
POWERTECH (USA), INC.
AND
ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING THE
DEWEY-BURDOCK IN SITU RECOVERY PROJECT
LOCATED IN CUSTER AND FALL RIVER COUNTIES
SOUTH DAKOTA

Date 03-19-14

WHEREAS, the U.S. Nuclear Regulatory Commission (NRC) received an application from Powertech (USA), Inc. (Powertech or applicant) for a new radioactive source materials license to develop and operate the Dewey-Burdock Project (the undertaking) located near Edgemont, South Dakota in Fall River and Custer counties (Project) pursuant to the NRC licensing authority under the Atomic Energy Act of 1954 (AEA), 42 U.S.C. §§ 2011 *et seq.*; and

WHEREAS, NRC is considering issuance of a license for the Dewey-Burdock In Situ Recovery [ISR] Project pursuant to its authority under the Atomic Energy Act of 1954 (AEA), 42 U.S.C. §§ 2011 *et seq.* which makes the project an undertaking requiring compliance by NRC with Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470, and its implementing regulations (36 CFR § 800 (2004)); and

WHEREAS, if licensed, the proposed project will use an In Situ Recovery (ISR) methodology to extract uranium and process it into yellowcake at the Dewey-Burdock site; and

WHEREAS, the proposed project area consists of approximately 10,580 acres (4,282 ha) located on both sides of Dewey Road (County Road 6463) and includes portions of Sections 1-5, 10-12, 14, and 15, in Township 7 South, Range 1 East and portions of Sections 20, 21, 27, 28, 29, and 30-35 in Township 6 South, Range 1 East, Black Hill Meridian, (see Appendix A and Figure 1.0 for fuller description and a map of the project area); and

WHEREAS, under the terms of the General Mining Act of 1872 Powertech has filed Federal Lode mining claims and secured mineral rights on 240 acres [97 ha] of public lands open to mineral entry and administered by the U.S. Department of the Interior, Bureau of Land Management (BLM), and has the right to develop the mining claims as long as this can be accomplished without causing unnecessary or undue degradation to public lands and in accordance with pertinent laws and regulations under 43 CFR Subpart 3809; and

WHEREAS, review and approval of a Plan of Operations for the project that meets the requirements of 43 CFR Subpart 3809 by the BLM-South Dakota Field Office makes the project an undertaking requiring compliance by BLM with Section 106 of the NHPA, 16 U.S.C. § 470 and 36 CFR Part 800; and

WHEREAS, the BLM, by letter dated April 7, 2011, has designated the NRC as the lead agency for compliance with requirements of Section 106 of the NHPA regarding the Dewey-Burdock Project

(ADAMS Accession No. ML11116A091) pursuant to 36 CFR § 800.2(a)(2) of the Section 106 regulations; and

WHEREAS, under the terms of the Safe Drinking Water Act, Powertech has submitted to the Environmental Protection Agency (EPA) two Underground Injection Control (UIC) Permit Applications for ISR uranium recovery and the disposal of treated ISR process fluids at the Dewey-Burdock site; the EPA will issue draft permit decisions that meet the requirements of UIC regulations found at 40 CFR Parts 124, 144, 146 and 147; and

WHEREAS, the NRC determined a phased process for compliance with Section 106 of the NHPA is appropriate for this undertaking, as specifically permitted under 36 CFR § 800.4(b)(2), such that completion of the evaluation of and determinations of effects on historic properties, and consultation concerning measures to avoid, minimize, or mitigate any adverse effects will be carried out in phases, as set forth in this Programmatic Agreement (PA) (see Appendix A for details); and

WHEREAS, the area of potential effects (APE) for the undertaking is the area at the Dewey-Burdock Project site and its immediate environs, which may be directly or indirectly impacted by construction and operation activities associated with the proposed project, as described in Appendix A; and

WHEREAS, Project activities may occur on lands outside the license boundary for the installation of electrical transmission lines, and will be addressed in accordance with Stipulations 3 and 4 of this PA; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(1)(i)(C), the NRC, by letter dated April 24, 2013, notified the Advisory Council on Historic Preservation (ACHP) of the potential for adverse effects to historic properties from the undertaking and invited the ACHP to participate in Section 106 consultation and in the preparation of this PA; and

WHEREAS, the ACHP, by letter, dated October 28, 2013, formally entered the consultation; and

WHEREAS, the NRC initiated consultation with the South Dakota State Historic Preservation Officer (SD SHPO) on December 2, 2009, during a face-to-face meeting held in Pierre, South Dakota; and

WHEREAS, the NRC invited Powertech to participate in Section 106 consultation and preparation of this PA; and

WHEREAS, by letters dated March 19, 2010 (ML100331999) and September 8, 2010 (ML102450647), the NRC invited 23 federally-recognized Indian Tribes who may ascribe religious and cultural significance to historic properties that may be affected by the undertaking, including the Cheyenne and Arapaho Tribes of Oklahoma, the Cheyenne River Sioux Tribe, the Crow Nation, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe, the Flandreau Santee Sioux Tribe, the Fort Peck Assiniboine and Sioux Tribes, the Lower Brule Sioux Tribe, the Lower Sioux Indian Community, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Omaha Tribe of Nebraska, the Pawnee Nation of Oklahoma, the Ponca Tribe of Nebraska, the Rosebud Sioux Tribe, the Santee Sioux Tribe of Nebraska, the Sisseton-Wahpeton Oyate, the Spirit Lake Sioux Tribe, the Standing Rock Sioux Tribe, the Three Affiliated Tribes (Mandan, Hidatsa & Arikara Nations), the Turtle Mountain Band of Chippewa Indians, and the Yankton Sioux Tribe (collectively referred to as Tribes), to each be a consulting party in the Section 106 process; and

WHEREAS, the following 23 Tribes participated in consultation at varying levels with the NRC and BLM regarding the proposed Dewey-Burdock Project: the Cheyenne and Arapaho Tribes of Oklahoma,

the Cheyenne River Sioux Tribe, the Crow Nation, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe, the Flandreau Santee Sioux Tribe, the Fort Peck Assiniboine and Sioux Tribes, the Lower Brule Sioux Tribe, the Lower Sioux Indian Community, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Omaha Tribe of Nebraska, the Pawnee Nation of Oklahoma, the Ponca Tribe of Nebraska, the Rosebud Sioux Tribe, the Santee Sioux Tribe of Nebraska, the Sisseton-Wahpeton Oyate, the Spirit Lake Sioux Tribe, the Standing Rock Sioux Tribe, the Three Affiliated Tribes (Mandan, Hidatsa & Arikara Nations), the Turtle Mountain Band of Chippewa Indians, and the Yankton Sioux Tribe; and

WHEREAS, the NRC worked with consulting Tribes between November 2011 and October 2012 to develop an approach for identifying historic properties of cultural and religious significance to Tribes; the NRC conducted a face-to-face consultation focused on the identification of these properties in February 2012. Although several work plans for a tribal field survey were prepared and discussed by the consulting parties throughout 2012, the parties were unable to reach agreement on the scope and the cost of the Tribal survey (see Appendix B for details); and

WHEREAS, in October 2012, the NRC requested alternative approaches to conduct a tribal field survey and subsequently proposed opening the project area to all interested Tribes to complete the survey according to their needs and interests, with payments to be made to participating Tribes (see Appendix B for details); and

WHEREAS, the NRC offered all 23 consulting Tribes the opportunity to participate in a tribal field survey to identify properties of religious and cultural significance to them for the proposed Dewey-Burdock project ISR facility by letter dated February 8, 2013; and

WHEREAS, the following seven Tribes participated in the tribal field survey: the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Cheyenne and Arapaho Tribes of Oklahoma, the Crow Nation, the Santee Sioux Tribe, the Crow Creek Sioux Tribe, and the Turtle Mountain Band of Chippewa Indians as discussed in details in Appendix A; and

WHEREAS, surveys to identify historic properties have been completed for the project including Class III archaeological surveys and tribal surveys to identify properties of religious and cultural significance; and

WHEREAS, the NRC received tribal survey reports with eligibility recommendations from the Northern Arapaho Tribe, the Northern Cheyenne Tribe, and the Cheyenne and Arapaho Tribes of Oklahoma, as well as field notes from the Crow Nation as discussed in Appendix A; and

WHEREAS, the NRC staff has reviewed and evaluated the results of the applicant's Class III archaeological surveys and tribal surveys in the development of its initial recommendations concerning eligibility of properties identified within the APE for the undertaking for inclusion on the National Register of Historic Places (NRHP) as presented in Appendix B; and

WHEREAS, the NRC has received concurrence from the SD SHPO on these eligibility determinations as discussed in Appendix B, eligibility determinations were also sent to the Tribes with a 30-day review and comment period; and

WHEREAS, the NRC invited each of the 23 consulting Tribes to participate in the development of this PA; and

WHEREAS, the following Tribes participated at varying levels in webinars and/or provided written comments during the preparation of this PA: Northern Cheyenne, Cheyenne River Sioux, Oglala Sioux, Standing Rock Sioux, Fort Peck Assiniboine and Sioux, and Cheyenne and Arapaho Tribes; (see Appendix B for list of participants); and

WHEREAS, each of the 23 consulting tribes will be invited to sign the PA as a Concurring Party; and

WHEREAS, the BLM, as a federal agency with a federal action related to this undertaking has participated in the Section 106 consultation and development of this agreement and will be a signatory; and

WHEREAS, the EPA has participated in discussions of this agreement; and

WHEREAS, the PA will be entered as a condition on the NRC license, if granted; and

WHEREAS, the PA will be entered as a condition of Powertech Inc.'s Plan of Operation, if approved by the BLM; and

WHEREAS, Powertech, as the applicant for federal approvals has been invited to execute this agreement as an invited signatory in recognition of the responsibilities assigned to the applicant under the terms of this agreement;

NOW, THEREFORE, the NRC, BLM, SD SHPO, Powertech, and the ACHP agree that the undertaking will be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties.

STIPULATIONS:

NRC (or BLM on BLM-administered land) shall ensure that the following measures are carried out within its regulatory authority:

1) Conditions for Federal Approval:

a) The NRC will require that Powertech comply with all applicable stipulations and provisions of this PA, as a condition of the Powertech license for the Project.

b) The BLM will ensure that a Record of Decision on an acceptable Plan of Operation will not be signed until all required signatories have executed this PA.

c) The NRC shall not grant a license to Powertech until all required signatories have executed this PA. Upon receipt of a fully executed PA, the NRC will issue the license when all other requirements for the license have been met.

d) If a license amendment is required due to a change in the design or operation of the Project, and if that change would involve ground disturbing activities outside the currently identified disturbance areas, NRC will reconsider the eligibility determinations (in accordance with Stipulation 3) of any archaeological sites with tribally defined features and any tribally identified sites previously found not eligible that may be affected by the new ground disturbance.

2) Identification and Evaluation of Historic Properties within the License Boundary:

a) Appendix B provides information on the archaeological and tribal filed surveys and describes the cultural resources identified within and adjacent to the boundary of the 10,580-acre project site. More than 300 cultural resources were identified.

b) In consultation with SD SHPO and the Tribes, the NRC and BLM have proposed eligibility determinations for 69 percent of the properties identified. Approximately 14 percent of identified sites have been determined eligible for listing on the NRHP, 55 percent have been determined not eligible, and 31 percent remain unevaluated.

3) Protection and Evaluation of Unevaluated Properties within the APE:

a) Powertech will protect all unevaluated properties until an NRHP-eligibility determination is completed, in accordance with 36 CFR § 800.4(c).

b) If changes in the design or operation of the Project, including wellfield configurations, result in ground disturbance that could affect unevaluated properties, Powertech shall sponsor necessary supplemental research and/or field investigations prior to commencing any ground-disturbance activities. Powertech will provide opportunities for consulting Tribes to help develop a draft investigation methodology for archaeological sites with tribal features and sites identified by the Tribes. The additional studies will provide information to enable NRC and/or BLM, in consultation with consulting Tribes, and the SD SHPO, to make NRHP-eligibility determinations for unevaluated cultural resources.

c) Powertech must provide a written plan of its investigation methodology (investigation plan) at least four months prior to commencement of work, to enable the NRC and BLM to allocate staff resources for Section 106 reviews; additional review time may be necessary if NRC and BLM staff resources are limited or due to conditions beyond the staff's control.

d) The NRC will distribute the proposed investigation plan to the 23 consulting Tribes soon after it is received from Powertech.

e) Upon receipt of the Powertech investigation plan, the NRC, the BLM, consulting Tribes and the SD SHPO will have 30 days to review the proposed plan. The NRC will consider any comments received in writing from consulting parties within the specified review period. If revisions to the plan are necessary, Powertech will revise the plan accordingly and circulate the revised investigation plan to the NRC (or BLM on BLM-administered land). The NRC will forward the revised plan to all consulting parties. A second review period of 30 days may be requested.

f) Upon approval of the investigation plan by the NRC (or BLM on BLM-administered land), Powertech will conduct supplemental research and/or field investigations and provide recommendations concerning NRHP-eligibility of previously unevaluated cultural resources for NRC consideration. If appropriate, testing will be conducted under the supervision of individuals meeting the Secretary of the Interior's Professional Qualifications Standards. The report shall follow documentation standards outlined in 36 CFR § 800.11.

g) After the completion of any additional studies, the NRC will submit the findings of NRHP-eligibility evaluation to BLM, SD SHPO, and consulting Tribes, with a 45-day period of review and comment.

h) The NRC may request revisions to the reports or additional investigations after consideration of comments received from BLM, SD SHPO, and consulting Tribes. The NRC will provide revisions to BLM, SD SHPO, and consulting Tribes, with a 30-day period for a second review and comments.

i) The NRC will submit final determinations of NRHP-eligibility and effects to SD SHPO for review and concurrence; this review will be completed by the SD SHPO within 30 days.

j) When the NRC, BLM, and SD SHPO, in consultation with the Tribes, agree on NRHP-eligibility, avoidance will be the preferred option. Avoidance measures may include, but are not limited to, the relocation of pipelines, roads, facilities, monitoring wells, and other disturbances. When avoidance is not possible, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.

k) If the NRC, BLM, and SD SHPO, in consultation with the Tribes, make the determination that identified cultural resources are not NRHP-eligible, no further review or consideration of the properties will be required under this PA.

l) When the NRC (or BLM on BLM-administered land) and the SD SHPO disagree on NRHP-eligibility and the disagreement is not resolved through further consultation and the resource cannot be avoided, the NRC will refer the issue to the Keeper of the National Register (Keeper) and request a formal determination of eligibility, in accordance with 36 CFR § 800.4(c)(2). The ACHP may also request referral of an NRHP-eligibility determination to the Keeper.

m) If a consulting Tribe that attaches religious and cultural significance to a property disagrees with an NRC (or BLM on BLM-administered land) eligibility determination, it may ask the ACHP to request the NRC or BLM to obtain a determination of eligibility from the Keeper in accordance with 36 § 800.4(c)(2).

4) Assessment of Effects:

a) As part of its consideration of the effects of construction and operations on the landscape, the NRC conducted a line-of-sight analysis to assess the potential for adverse visual effects on all known historic properties located within three miles of the tallest buildings on both the Dewey and Burdock facilities.

b) The NRC and BLM consulted with SD SHPO and consulting Tribes in making its determination that eligible or unevaluated archaeological sites and properties of religious and cultural significance will be adversely affected by the undertaking. The effects determination is presented in Appendix B Table 1:0.

c) The NRC and BLM will consult with all consulting parties to develop proposals to resolve these adverse effects (as summarized in Appendix B Table 2:0) in accordance with the process set forth in Stipulation 5—Resolution of Adverse Effects.

5) Resolution of Adverse Effects:

a) The NRC will solicit suggestions from consulting parties concerning potential measures to avoid, minimize, or mitigate adverse effects on historic properties described in Appendix B after the PA is executed.

b) The NRC and BLM, in consultation with consulting parties, will determine what treatment measures are appropriate to each adversely affected historic property.

c) Treatment measures can include, but are not limited to the following:

i. For archaeological properties that are significant for their research data potential (Eligibility Criterion D, National Register of Historic Places), the treatment measures may follow standard mitigation through data recovery. Treatment plan(s) for data recovery shall include, at a minimum, a research design with provisions for data recovery and recordation, analysis, reporting, and curation of resulting collection and records, and shall be consistent with the *Secretary of Interior's Standards and Guidelines* (48 FR 44734-44737). Treatment plan(s) must be consistent with easement and permit requirements of other agencies, when applicable. To the extent possible, treatment plan(s) should group related sites and areas, so related resources can be considered in context, and to minimize the burden of review and approval by agencies.

ii. Treatment plan(s) for properties eligible under Criteria A, B and C, or significant for values other than their potential research potential shall specify approaches for treatment or mitigation of the property in accordance with the principles, standards, and guidelines appropriate to the resource, if warranted. This may include, but not be limited to, use of such approaches as relocating the historic property, landscaping to reduce visual effects, public interpretation, ethnographic recordation, oral history, archival research, or prescribing use of a component or activity of this undertaking in such a way as to minimize effects to historic properties. Methods of recordation and documentation described in the treatment plan(s) shall conform to the *Secretary of the Interior's Standards for Architectural and Engineering Documentation* (48 FR 44730-44734) or other standards specified by NRC.

iii. In lieu of standard mitigation approaches described above, treatment plan(s) may adopt other alternative approaches to avoid, minimize, or mitigate effects to historic properties, including, but not limited to, assisting in the development of Tribal historic preservation plans, developing detailed historic contexts for the region, developing educational materials, purchasing properties containing historic resources, or developing historic property management plans.

d) Powertech shall prepare a treatment plan for each affected historic property, following the potential treatment measures developed through consultation with all consulting parties,

e) In conjunction with the submission of their Plan of Activities, which detail construction and operations activities for each year, Powertech will submit one or more draft treatment plans based on input provided by all consulting parities. A draft plan will identify properties that will be affected that year and measures that will be taken to avoid, minimize, or mitigate those effects. A draft treatment plan will be submitted for NRC and BLM review and approval four months prior to construction, so the NRC and BLM can appropriately allocate staff resources to the extent possible; additional time may be necessary in the event that NRC and BLM staff resources are limited due to conditions beyond the staff's control.

i. The treatment plan shall contain a description of the effects on each adversely affected historic property and a description of the proposed treatment for each of those historic properties.

ii. If monitoring by a qualified archaeologist and/or Tribal monitor is part of the strategy for resolving or preventing adverse effects, the treatment plan shall include a Monitoring Plan. The objective of monitoring is to protect known sites from construction impacts, identify at the time of discovery any archaeological materials exposed during ground disturbance, and protect such resources from damage until the procedures for discoveries per Stipulation 9—Unanticipated Discoveries are implemented.

iii. If data recovery is determined to be an appropriate treatment and part of the strategy for resolving adverse effects, the treatment plan shall specify all details of the research design, field and laboratory work methodology (including mapping, geomorphological or other specialized studies, controlled scientific excavation methods, analyses of data recovered, and photographic documentation as appropriate), and report preparation.

f) Upon receipt of a draft treatment plan, the NRC will submit the draft treatment plan to all signatories and consulting Tribes for a 45-day review and comment period. The NRC will consider any comments received in writing from consulting parties within the specified review period.

g) The NRC may ask Powertech to revise the draft treatment plan based on comments received from the consulting parties. The NRC will forward revisions to the draft treatment plan and request for a second review by all signatories and consulting Tribes within a 30-day period.

h) The NRC will then distribute the final treatment plan to SD SHPO for a 30-day review period, and copies of the plan will be distributed to consulting parties.

i) Upon concurrence by the SD SHPO, or if the SD SHPO does not respond in writing within 30 days, the NRC shall direct Powertech to implement the treatment plan.

j) If, after consultation, the NRC and the SD SHPO cannot agree on appropriate terms for the treatment plan, the NRC will refer the matter to the ACHP for comment pursuant to Stipulation 14—Dispute Resolution. The NRC will consider ACHP comments in making its final decision on measures to resolve the adverse effects.

6) Future Identification of Cultural Resources for Installation of Power Transmission Lines in Areas to be Determined:

a) Powertech will notify the NRC and BLM in writing, if it determines that ground-disturbing activities will be required for the installation of electrical transmission lines outside the license boundary. Powertech must provide written notification at least four months prior to commencement of work, to enable the NRC and BLM to allocate staff resources for Section 106 reviews; additional review time may be necessary if NRC and BLM staff resources are limited or due to conditions beyond the staff's control.

b) Powertech must provide the NRC, the BLM, and the SD SHPO a proposed work plan for a survey to inventory historic properties within the APE for each transmission line as part of the written notification. The plan will include methods for identification of all kinds of cultural properties within the transmission line corridor, including identification of properties of religious

and cultural significance with the involvement of the Tribes. The proposed plan should also include report preparation requirements and schedules for the identification efforts.

c) The NRC will distribute the proposed work plan to the 23 consulting Tribes soon after it is received from Powertech.

d) Upon receipt of the proposed Powertech work plan, the NRC, the BLM, consulting Tribes and the SD SHPO will review and provide comments on the plan within 30 days. The NRC will consider any comments received in writing from consulting parties within the specified review period. The NRC may ask Powertech to revise the draft work plan based on comments received from the consulting parties. The NRC will forward the revised plan to all consulting parties. A second review period of 30 days may be requested.

e) Upon NRC approval of the work plan, Powertech will conduct surveys to identify historic properties along the transmission corridor within an appropriate APE. Powertech will also undertake necessary testing in order to propose NRHP-eligibility of any newly identified properties for NRC consideration. Survey and testing will be conducted under the supervision of individuals meeting the Secretary of the Interior's Professional Qualifications Standards. The report shall follow documentation standards outlined in 36 CFR § 800.11.

f) Powertech shall offer to provide appropriate financial compensation to Tribal Representatives for the work on the identification of properties of religious and cultural significance. The identification of properties of religious and cultural significance will occur at the same time or prior to identification of archaeological properties.

g) The NRC will consult with the 23 consulting Tribes on identification of properties of religious and cultural significance. This consultation could include various approaches such as an open site survey opportunity to identify and evaluate places of religious and cultural significance to the Tribes.

h) Upon receipt of Powertech's completed survey report, the NRC will submit the findings to the BLM, SD SHPO, ACHP, and the consulting Tribes for a review and comment period of 45 days.

i) The NRC may request revisions to survey reports or additional investigations, after consideration of timely comments made by BLM, SD SHPO, ACHP, and consulting Tribes. The NRC will provide revised documents to BLM, SD SHPO, and Tribes. A second review period of 30 days may be requested.

j) The NRC will submit final determinations of NRHP-eligibility and effects to the SD SHPO for review and concurrence; this review will be completed within 30 days of the SD SHPO receiving complete information. The NRC will circulate copies of this correspondence to the other consulting parties. The NRC will consider any comments received within the 30-day period.

k) When the NRC, BLM, and SD SHPO agree evaluated properties are NRHP-eligible, avoidance of the properties will be the preferred option. When avoidance is not possible and adverse effects will result, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.

l) If the NRC, BLM, and SD SHPO make the determination that identified cultural resources are not eligible for listing on the NRHP, no further review or consideration of the properties will be required under this PA.

m) When the NRC (or BLM on BLM-administered land) and the SD SHPO disagree on NRHP-eligibility and the disagreement cannot not be resolved through further consultation and avoidance is not an option, the NRC will refer the issue to the Keeper and request a formal determination of eligibility, in accordance with 36 CFR § 800.4(c)(2). The ACHP may also request referral of an NRHP-eligibility determination to the Keeper. The decision of the Keeper will be final.

n) If a consulting Tribe that attaches religious and cultural significance to a property disagrees with an NRC (or BLM on BLM-administered land) eligibility determination, it may ask the ACHP to request the NRC or BLM to obtain a determination of eligibility from the Keeper in accordance with 36 § 800.4(c)(2).

7) Coordination with Other Federal Reviews:

Any federal agency that will provide approvals or assistance for the undertaking as presently proposed may comply with its Section 106 responsibilities for the undertaking by agreeing to the terms of this PA in writing and sending copies of such written agreement to all the signatories and consulting parties of this PA. Such agreement to the terms of this PA will not necessitate an amendment to the PA.

8) Confidentiality:

The NRC, BLM, and other parties to this agreement acknowledge the need for confidentiality concerning tribal spiritual and cultural information, which was or may be provided to the NRC and BLM during the consultation process. Information provided by consulting tribal representatives, which has been identified as sensitive and was accompanied by a request for confidentiality, will remain confidential to the extent permitted by state and federal laws.

All consulting parties shall restrict disclosure of information concerning the location or other characteristics of historic properties, as well as properties of religious and cultural significance to Tribes, to the fullest extent permitted by law in conformance with Section 304 of the NHPA, South Dakota Codified Laws (SDCL), § 1-20-21.2, Section 9 of the ARPA, and Executive Order on Indian Sacred Sites 13007 (61 FR 26771; May 29, 1996).

9) Unanticipated Discoveries:

In the event a previously unknown cultural resource is discovered during the implementation of the Dewey-Burdock Project, all ground disturbance activities shall halt within 150 feet of the area of discovery to avoid or minimize impacts until the property is evaluated for listing on the NRHP by qualified personnel. The following additional steps shall be taken:

a) Powertech will notify the NRC, the BLM (if the site is on BLM land), and the SD SHPO of the discovery within 48 hours. Unanticipated discoveries may include artifacts, bone, features, or concentrations of these materials outside previously identified sites, or in and adjacent to previously identified eligible and not eligible sites. Discoveries may also include stones and groups of stones that are out of place in their sedimentary contexts and may be parts of stone features. A "discovery" may also include changes in soil color and texture, or content suspected to be man-made, such as burned soil, ash, or charcoal fragments.

b) The NRC and BLM (as appropriate) will contact the THPO and/or the Tribal Cultural Resource Office(s) to notify them of an unanticipated discovery soon after notification from Powertech is received.

c) Powertech will have the discovery evaluated for NRHP eligibility by a professional who meets the Secretary of the Interior's Professional Qualifications Standards in Archaeology (36 CFR § 61).

d) Powertech will provide results of evaluation and initial eligibility recommendation to the NRC and BLM within ten business days of the discovery. If Tribes want to participate in the evaluation efforts, they should contact Powertech within the specified review period.

e) The NRC and/or BLM, in consultation with Tribes and other consulting parties, shall evaluate the cultural resources to determine whether they meet the NRHP criteria and request concurrence of the SD SHPO. Evaluation will be carried out as expeditiously as possible, not to exceed 5 business days.

f) When the NRC, BLM, and SD SHPO agree evaluated properties are NRHP-eligible, avoidance of the properties will be the preferred option. When avoidance is not possible and adverse effects will result, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.

g) If the NRC, BLM, and SD SHPO, in consultation with the Tribes, make the determination that identified cultural resources are not eligible for listing on the NRHP, no further review or consideration of the properties will be required under this PA.

h) Human remains identified during ground disturbance activities will be treated in accordance with Stipulation 10—Human Remains and Appendix D—Treatment of Human Remains on State, Private, and BLM Land.

i) In the event of unanticipated discovery, Powertech may continue to work in other areas of the site; however, ground disturbance activities shall not resume in the area of discovery until the NRC and BLM have issued a written notice to proceed.

10) Human Remains:

a) The NRC, BLM, and Powertech recognize human remains, funerary objects, sacred objects, and items of cultural patrimony encountered during ground disturbance activities should be treated with dignity and respect.

b) Native American human remains, funerary objects, sacred objects, or items of cultural patrimony found on BLM land will be handled according to Section 3 of the Native American Graves Protection and Repatriation Act (NAGPRA) and its implementing regulations (43 CFR § 10). BLM will be responsible for compliance with the provisions of NAGPRA on Federal land.

c) Native American human remains, funerary objects, sacred objects, or items of cultural patrimony found on state or private land will be handled in accordance with applicable law as described in Appendix D – Treatment of Human Remains on State, Private, and BLM Land.

d) Non-Native American human remains found on federal, state, or private land will also be treated in accordance with applicable state law.

11) Disposition of Archaeological Collections:

a) BLM will curate artifacts, materials or records resulting from archaeological identification and mitigation conducted on BLM land at the Billings Curation Center, in accordance with the Billings Curation Center Packaging Requirements in accordance with 36 CFR § 79, "Curation of Federally-Owned and Administered Archaeological Collections." BLM will consult with Tribes as required by 36 CFR § 79.

b) Where testing or excavation is conducted on private land, any recovered artifacts remain the property of the landowner. Powertech will return the artifacts to landowners. Powertech will encourage landowners to donate the artifacts to the SD Archaeological Research Center or a Tribal entity, in coordination with the NRC, SHPO, and participating Tribes. Where a property owner declines to accept responsibility for the artifacts and agrees to transfer ownership of the artifacts to SD Archaeological Research Center or Tribal entity, Powertech will assume the cost for curating the artifacts in a facility meeting the requirements of 36 CFR § 79, "Curation of Federally-Owned and Administered Archaeological Collections."

12) Qualifications:

The identification, evaluation, and mitigation of historic properties carried out pursuant to this PA shall be performed by or under the direct supervision of qualified individuals in the appropriate historic preservation discipline meeting, at a minimum, the appropriate standards set forth in 36 CFR § 61.

In recognition of the special expertise Tribal experts have concerning properties of religious and cultural significance, the standards of 36 CFR § 61 will not apply to knowledgeable, designated tribal representatives carrying out identification and evaluation efforts for properties of religious and cultural significance to Tribes.

13) Compliance Monitoring:

NRC affirms avoidance of adverse effects to historic properties remains the preferred course of action.

a) Powertech will ensure employees and/or contractors involved in all phases of the Project are aware of and comply with the requirements of the PA. Powertech may use measures such as initial orientation training, as well as pre-job briefings to inform employees and contractors of their responsibilities under the PA. Compliance with this PA is a condition of the NRC license and a condition of the BLM Plan of Operations.

b) Prior to initiating construction activities, Powertech will develop a Monitoring Plan specific to the project, identifying specific areas, activities, and if appropriate, historic properties that require monitoring during development of the Project, ensuring the requirements of this PA and the treatment plans developed under the provisions of Stipulation 5—Resolution of Adverse Effects are met. The monitoring plan will include provisions for annual reporting of the results of the monitoring program to the signatories and the consulting Tribes to this PA.

    i. Powertech will provide the Monitoring Plan to the NRC, which will distribute it to the signatories and consulting Tribes to this agreement for a 30-day review and comment period.

ii. The NRC will request that Powertech make any necessary revisions to the plan, and the revised Monitoring Plan will remain in effect for all covered ground-disturbing activities during the license period.

c) Powertech will engage the services of a Monitor with specific responsibilities to coordinate the requirements of the monitoring plan, the treatment plans, and this agreement during project construction.

i. The Monitor will meet the Secretary of the Interior's Professional Qualifications for Archaeology. Preference will be given to individuals meeting those qualifications who are employed by tribal enterprises, especially during phases of the monitoring program where sites with religious and cultural significance to the Tribes might be affected. In the case of an unanticipated discovery or imminent threat to a historic property (for which avoidance had been planned), the Monitor shall have authority to stop certain construction activities.

ii. The Monitor will coordinate with Powertech and its contractors during the construction phases of the Project.

d) Powertech will provide periodic updates to all consulting parties on the status of the monitoring program as specified in Appendix C.

14) Dispute Resolution:

Should any signatory to this PA object in writing to any actions proposed or to the manner in which terms of the PA are implemented, the NRC shall consult with the party to resolve the objection. If the NRC determines the objection cannot be resolved, the NRC will:

a) Forward all documentation relevant to the dispute, including the NRC proposed resolution, to the ACHP and send a copy to all other consulting parties. The ACHP shall provide NRC with its advice on the resolution of the objection within 30 days of receiving adequate documentation. Prior to reaching a final decision on the dispute, NRC shall prepare a written response that takes into account timely advice or comments regarding the dispute from the ACHP, signatories, concurring parties, and consulting parties, and provide a copy of this written response to them. NRC will then proceed according to its final decision.

b) If the ACHP does not provide its advice regarding the dispute within the 30-day period, the NRC may make a final decision on the dispute and proceed accordingly. Prior to reaching a final decision, NRC shall prepare a written response that takes into account timely comments regarding the dispute from the signatories, concurring parties, and consulting parties, and provide them and the ACHP with a copy of such written response.

c) NRC responsibilities under this Agreement, which are not the subject of the dispute, shall remain unchanged.

15) Amendment:

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

Concurring parties will be provided an opportunity to consult and comment on the proposed amendment. An amendment will be effective on the date the amended PA is signed by all of the signatories to this PA. If a required signatory does not sign the amended PA, the amendment will be void. The amendment shall be appended to this PA as an Appendix.

16) Termination:

a) If any signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment to the PA pursuant to Stipulation 15—Amendment. If within 30-days (or another period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the PA upon written notification to the other signatories.

b) If this PA is terminated the NRC shall either (i) execute a new PA pursuant to 36 CFR § 800.6(c)(8) with signatories as defined in Section 800.6 (c)(1) of Title 36 or, (ii) the NRC shall request comments, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7(c)(4). NRC shall notify the signatories as to the course of action it will pursue.

c) After the termination of this PA and until the NRC completes consultation and a new PA is executed or the NRC has requested, taken into account, and responded to the comments of the ACHP under 36 CFR § 800.7(c)(4), Powertech is required to follow the terms and conditions of this PA for current ground-disturbing activities and is not permitted to begin any such activities in new areas.

d) If the terms of this PA are satisfied prior to its expiration date, NRC shall provide written notification to the other signatories and consulting parties to close out this agreement.

17) Duration:

This PA shall remain in effect for 10 years from its date of execution (last date of signature), or until completion of the work stipulated, whichever comes first, unless extended by agreement among the signatories. During the effective period and prior to the expiration of the PA, the NRC may consult with the signatories and concurring parties to amend this stipulation to extend the duration of the PA, in accordance with Stipulation 15—Amendment.

18) Anti-Deficiency Act:

The stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act (Pub.L. 97–258, 96 Stat. 923; 31 U.S.C. §1341, Limitations on expending and obligating amounts). If compliance with the Anti-Deficiency Act alters or impairs the ability of the NRC to implement this Agreement, the NRC will consult in accordance with the amendment and termination procedures in this Agreement.

Execution of this PA by the NRC, BLM, SD SHPO, ACHP, and Powertech and the implementation of its terms is evidence the NRC and BLM have taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

This PA may be executed in counterparts, each of which shall constitute an original, and all of which shall constitute one and the same agreement.

Hannan E. LaGarry, Ph.D.
526 Chapin Street
Chadron NE 69337

SUMMARY OF 2010-2020 EXPERT OPINIONS ON THE ENVIRONMENTAL SAFETY OF ISL URANIUM MINING AT THE DEWEY-BURDOCK SITE (POWERTECH/ AZARGA), FALL RIVER COUNTY, SOUTH DAKOTA

I, the undersigned, Hannan E. LaGarry, Ph.D., an individual, residing at 526 Chapin Street in Chadron NE 69337, hereby provide the following SUMMARY OF 2010-2020 EXPERT OPINIONS ON THE ENVIRONMENTAL SAFETY OF ISL URANIUM MINING AT THE DEWEY-BURDOCK SITE (POWERTECH/AZARGA), FALL RIVER COUNTY, SOUTH DAKOTA. These written comments are provided to the OGLALA SIOUX TRIBE (OST) for submission to the BUREAU OF LAND MANAGEMENT (BLM) on or before the close of the Dewey-Burdock Pubic Comment Period ending 26 AUGUST 2020.

INTRODUCTION

I have served as an expert witness for local residents and the Oglala Sioux Tribe to support their ongoing legal interventions against nearby uranium mining since 2008, and I have provided numerous expert opinions for both the Crow Butte Resources (CAMECO) and Dewey-Burdock (Powertech/Azarga) ISL uranium mining license interventions. In these opinions (LaGarry 2008a, 2008b, 2010, 2012, 2014a, 2014b, 2014c, 2014d, 2015a, 2015b, 2015c, 2015d, 2015e, 2018a, 2018b, 2019), I provided reviews of stratigraphy, geological structures, lineaments, secondary porosities, artesian flow, and potential contaminant migration pathways at both mines. In each case, I challenged mine operators' assertions of confinement of pregnant lixiviant (mine fluids saturated with uranium and other toxic heavy metals) within the producing aquifer(s).

These expert opinions were submitted to the Nuclear Regulatory Commission's Atomic Safety and Licensing Board and Region 8 of the Environmental Protection Agency. In this document, I update and compile these prior opinions concerning the Dewey-Burdock Site for the Bureau of Land Management. Copies of the original opinions are readily available as .pdfs for digital download on the NRC's ADAM online database and on my professional webpages on Researchgate.net.

PROFESSIONAL BACKGROUND AND QUALIFICATIONS

I have 32 years of experience studying the geology of northwestern Nebraska and southwestern South Dakota. From 1988-1991 I collected fossils from northern Sioux County, Nebraska for my dissertation work. From 1991-1996 I led field parties from the University of Nebraska State Museum that mapped the vertebrate fossils and stratigraphy of the Oglala National Grassland in Sioux and Dawes counties, Nebraska. From 1996-2006 I led teams of geologists from the Nebraska Geological Survey that mapped in detail the surficial geology of most of northwestern Nebraska (a total of 80 1:24,000 quadrangles). This mapping included the entire Pine Ridge including the region between Crawford, Nebraska and Pine Ridge, South Dakota. These maps, including digital versions (ArcInfo) and supporting field notes, are available from the University of Nebraska-Lincoln School of Natural Resources and the United States Geological Survey. As a direct consequence of this mapping, I published peer-reviewed papers on the Chadron Formation (Terry & LaGarry 1998), the Brule Formation (LaGarry 1998), the mapping of surficial deposits (Wysocki & others 2000, 2005), and local faults (Fielding & others 2007). Stratigraphic studies intended to revise and reclassify the remaining rocks and surficial sediments of northwestern Nebraska and adjacent South Dakota are ongoing.

In addition to my ongoing geological work in Nebraska, I led teams of students and faculty at Oglala Lakota College in Kyle, South Dakota that studied the geology, groundwater, surface water, and heavy metal contaminants of southwestern South Dakota and the Pine Ridge Reservation (LaGarry & Sanovia 2014). From 2012-2018, our research was funded by the National Science Foundation's Tribal Colleges and Universities Program (NSF TCUP) and Experimental Program for Stimulating Competitive Research (NSF EPSCoR), and the USDA

National Institute for Food and Agriculture (NIFA) Tribal College Equity Program. We worked in close partnerships with Chadron State College, the South Dakota Geological Survey, the South Dakota School of Mines and Technology, South Dakota State University, the University of Illinois Urbana-Champaign, the University of Illinois Center for Advanced Materials Purification of Water Systems, the Department of Health Physics at the University of Michigan School of Nuclear Engineering, the University of Washington Native American Research Center for Health, and the Technological University of Darmstadt, Germany.

As a consequence of this environmental work, I have authored or coauthored reports detailing the results of studies describing toxic heavy metal contamination of drinking water on the Pine Ridge Reservation (Salvatore & others 2010, Botzum & others 2011), characteristics of reservation aquifers (Gaddie & LaGarry 2010, LaGarry & others 2012), potential uranium contamination risk to communities on the Pine Ridge Reservation (LaGarry & Yellow Thunder 2012), the transmission of uranium-contaminated water along regional faults (Bhattacharyya & others 2012), levels of ionizing background radiation in Oglala Lakota County (Garnette & others 2017), the contamination potential of soils derived from uraniferous bedrock (Vasek & others 2017), and most recently, I led a team from the Lakota People's Law Project that sampled and analyzed heavy metals (incuding uranium and mercury) and other elements in the surface waters of western South Dakota and the Pine Ridge Reservation (LaGarry 2020).

THE DEWEY-BURDOCK SITE

South Dakota has been mined for uranium, a highly toxic heavy metal, since the late 1930s. From its inception through the late 1960s this mining was done primarily in open pits that have not yet been reclaimed. Beginning in the 1980s, uranium mining resumed using in situ leach (ISL) methods, and continues to this day. In addition to being radioactive, uranium is also extremely toxic. Uranium alpha decay causes increased instances and severities of cancer primarily at blood-filtering or capillary-dense locations within the body, primarily the kidneys, pancreas, liver, and membranes surrounding the brain. Uranium toxicity attacks the kidneys,

leading to renal failure and potentially death, and is a major cause of debilitating and potentially fatal birth defects (Irwin 1997). In order for ISL mining to be considered safe, the mined uranium-bearing strata must be isolated from rocks above and below by confining layers. Confining layers must be continuous, unfractured, and unperforated in order for confinement to exist and for toxic heavy metals to be contained.

Natural breaches in the confining layers make confinement of contaminants unlikely, and also provide conduits to transmit contaminants to surrounding areas

In 2007 a 3.1 magnitude earthquake, lasting 30 seconds, opened up a fracture (called a "joint" or "fault") in the that had previously been closed, and the entire perennial flow of Chadron Creek disappeared into the ground. This effectively "turned off" Chadron's surface water supply, and our community of 5,800 people had to find an alternate source of water. Since I have lived in Chadron intermittently from 1996-2006 and permanently since 2007, this directly impact me and my family. Chadron now uses abandoned irrigation wells on the Hartville Table 20 miles south of town and pipes the water in. In many of my prior opinions, and in testifying before the Atomic Safety and Licensing Board, I have opined that a similar situation could occur with any additional earthquake (there are 3-4 each and every year) anywhere in the region, with the potential for transmission of water in either direction (up or down). Water transported up will almost certainly be contaminated (Botzum & others 2011, Bhattacharrya & others 2012).

My concerns regarding the Dewey-Burdock Project expressed in my first expert opinion on the site (see LaGarry 2010 opinion) are centered around the problems of secondary porosity in the form of faults and joints, the lack of confinement, artesian flow, and the horizontal flow of water within the uranium-bearing strata. Powertech's environmental report is poorly referenced overall, but especially so in parts concerning the geology of the region. The conclusions concerning the geology within the proposed area are based on in-house studies and unpublished theses and reports. It is beyond the scope of this opinion to review the entire scientific literature for the region, but I provide the most readily available recent research. Where appropriate, I also refer to specific sections of Powertech's environmental report to the US Nuclear Regulatory Commission (NRC) for the construction of the Dewey-Burdock Project.

Secondary porosity, in the form of intersecting faults and joints, is common in all of the rocks north, east, and south of the Black Hills Dome, especially north of and along the Pine Ridge Escarpment (see Swinehart & others 1985). These faults and joints are generally oriented NW-SE and SW-NE, and are most likely a result of the ongoing uplift of the Black Hills of southwestern South Dakota. Although a few people consider the Black Hills uplift to have ended by the late Cretaceous (~65 Ma), the Black Hills were tectonically active in the late Eocene (Evans & Terry 1994), and continued to fault, fracture, and fold the rocks of northwestern Nebraska and southwestern South Dakota into the middle Miocene (Fielding & others 2007). Based on numerous small earthquakes along the Sandoz Ranch-Whiteclay Fault, the area is still tectonically active (McMillan & others 2006). These earthquakes are relatively mild, and don't significantly damage surface infrastructure. However, even small earthquakes represent shifting and flexing of the earth's crust, and are continuously creating, closing, and redistributing the secondary porosity of the region's rocks. This means that joints incapable of transmitting water one day may be able to transmit water at a later date. These faults and fractures transect all major bedrock units of the region. These faults likely connect the uranium-bearing strata to adjacent aquifers as well as modern river alluvium.

Lack of confinement - In order for ISL mining to be considered safe, the uranium-bearing, mined strata must be isolated from rocks above and below by confining layers. There are three principal pathways through which contaminated water could migrate away from the uranium-bearing strata through adjacent confining layers. The first, and most common, are along joints and faults (see above). Where present, joints and faults penetrate confining layers above and below. The second is through thinning or pinching out of confining layers. In their application to the NRC, Powertech concedes that the upper confining layers thin and there are breaches in the upper confining layers. The third pathway for mine fluids to breach containment is through perforations made by wells. In Powertech's application, they repeatedly mention "thousands of exploratory wells," along with wells that supply drinking water (the uranium-bearing strata are a local drinking water supply) and water for livestock. In addition, many of these wells are abandoned and most likely improperly plugged. Once mining begins, and minerals are being extracted, flow pathways within the uranium-bearing rocks will change, potentially creating circumstances in

which any one of these wells could allow lixiviant to breach confinement. Once into adjacent water-bearing strata or the land surface, contaminants can enter rivers and flow downstream with each successive rain event, or flow down gradient into other water supplies.

The problem of artesian flow - Artesian flow occurs when there is a hydrologic connection, through faults or highly permeable strata, between groundwater sources and the land surface. The weight of water in overlying strata exerts pressure downward into water within the uranium-bearing strata, which can then be released as artesian water flow where the topographically lower uranium-bearing strata is exposed at the surface, or where it is punctured by drilling. Artesian flow was observed or predicted by Powertech in their Dewey-Burdock Project proposal. Artesian flow is most likely where the upper confining layer is perforated by secondary porosity, poorly constructed or improperly sealed exploration wells, or thinning or absence of upper confining layers. Artesian flow could transmit lixiviant, the most toxic mineral-laden of waters, onto the land surface (and into Cheyenne River, White River, or Hat Creek alluvium) and discharge large amounts of contaminants into aquifers or faults in a very short time.

Horizontal flow - Confining layers adjacent to uranium-bearing strata limit the unwanted spread of contaminants from an ISL site. However, horizontal flows within the uranium-bearing strata are also of concern. Such flow can rapidly redirect lixiviant or mine waste away from the mine site and into unexpected breaches in the confining layers. In their application to the NRC, Powertech reports horizontal flows within the uranium-bearing strata (the Inyan Kara Group) of up to 35.5 meters day (Chilson Member) based on local conditions, and of up to 6,000 ft^2/day elsewhere in the Black Hills region. Even if secondary porosity, artesian flow, or lack of confinement did not contaminate nearby water supplies, down gradient flow along the Cascade and Chilson anticlines (Rothrock 1931a, 1931b, 1948) would transmit contaminants to the major, mapped faults north of the Pine Ridge in Nebraska in less than 5 years (using the smaller value).

Thinning of confinement layers - The thickness of a geological stratum depends of several factors, including how it was deposited onto the ancient landscape, the lateral limits of the depositing environment, and whether or not it was partly eroded by subsequent geological

activity. Such an assessment is difficult in the subsurface, and requires extensive drilling or seismic refraction techniques to determine. Despite these difficulties, Powertech conceded its initial application that the upper confining layers thin and that breaches exist. Based on this admission, confinement does not exist at the site.

Over 7,500 exploratory well, some of which were done improperly, make confining lixiviant at the Dewey-Burdock Site impossible and contamination of the surrounding almost certain

The Dewy-Burdock Site has been the focus of intense exploratory drilling since the 1970's. Prior to renewing mining at the site, the current operators sought that old drilling data to better inform their proposed mining. Prior to the initial 2014 Dewey-Burdock licensing hearing, the operators were required by law to disclose this data to the intervenors, which they declined to do. The NRC ASLB consequently ordered the operators, based in Edgemont, to disclose this data to the intervenors' experts. In November 2014, my assistants and I were able to review drillers' notes from 4,177 boreholes (56% of the 7515 total) in 2.5 bankers' boxes, with at least 2.5 bankers' boxes of similar records remaining unexamined. We also examined 488 full-sized (in 3 boxes) and 1774 "mini" resistivity and gamma log pairs (30% of the 7515 listed above), with at least 6 bankers' boxes and 5 file cabinets of similar records remaining unexamined (see LaGarry 2014d opinion). Because of the limited time available and the lack of modeling, we did not attempt to reconstruct the geology of the proposed license area. Rather, we focused on the first-hand accounts of the geology of the site and the drilling conditions recorded by the geologists logging the wells. Based on our review of the data, we documented the following unique instances:

140 open, uncased holes
16 previously cased, redrilled open holes
4 records of artesian water
13 records of holes plugged with wooden fenceposts
6 records of holes plugged with broken steel
12 records of faults within or beside drilled holes
1 drawing of 2 faults and a sink hole within a drilled transect 7 notations "do not record this value on drill hole maps"
2 notations "do not return this to landowner"
63 redacted borehole logs

Based on the observations noted above, I offer the following conclusions: 1) we examined 56% of the available data, whereas the formal NRC review of 1% of the available data grossly misrepresents the sample, and is not scientifically valid or useful in any meaningful way, 2) 140 uncased holes allow unrestricted communication between water- bearing strata at the site, breaching whatever confinement might have been originally available, 3) artesian flow within the boreholes at the site clearly shows that the secondary porosity at the site allows communication of water between the aquifers onsite and offsite, 4) boreholes plugged with anything other than concrete degrade and become open increasing the number of open holes over time (it will get worse unless proactively plugged), 5) despite repeatedly asserting that there are no faults at the site (including in the EIS), faults were intersected while drilling boreholes, 6) redactions and notations in the drillers' records to withhold data imply that there was an attempt to deceive somebody or withhold information about the character of particular boreholes, 7) water in boreholes indicates water moving between aquifers or meteoric water getting into the holes, both indicating a pathways for the spread of contaminants, 8) records of muddy, damaged, or destroyed samples and missing data suggests circumstances in which the confining units would be misidentified, leading to miscorrelations of strata and confining layers considered present when in fact they are not, and 9) the missing records mentioned earlier create the impression of duplicity by the operators.

Planned disposal of of mine waste will contaminate residential and agricultural wells south of Hot Springs, South Dakota and eventually the Pine Ridge Reservation

During the initial EPA hearings regarding the proposed injection of contaminated wastewater from the site (see LaGarry 2017 opinion) there was much discussion about whether or not groundwater within the Minnelusa Aquifer flowed west, east, or not at all. In their application for underground-injection controlled storage of mine waste, Powertech defended their proposed activity by claiming that according to the USGS, water flows SW away from inhabited areas.

Contaminant flow away from the site - I double-checked the cited publication and found that Powertech's characterization is true but misleading. Based on groundwater flow mapping by the United States Geological Survey (Driscoll and others 2002), water in the vicinity of the Dewey-

Burdock site flows S/SE along the southern edge of the Black Hills, and once into greater Fall River County, groundwater flow is due east This report makes no mention of a groundwater divide or other circumstance that would indicate isolation of groundwater within the Dewey-Burdock vicinity. In fact, Figure 70 of that publication clearly shows that while groundwater flow north of Dewey-Burdock may initially be to the SW into Wyoming, this flow path quickly corrects to southward and then eastward flow. The flow from north of Dewey-Burdock to the SW has been measured at 591 feet/day, but flow south of the site has been measured at 7,393 feet/ day. Once eastward flow is established, its been measured at 4,349 feet/day to the east at the SD-WY state line, then 1,463 feet/day to the east in northern Fall River County and 732 feet/day to the east in central and southern Fall River County. On average, flow from Dewey-Burdock towards Edgemont, Hot Springs, Buffalo Gap, Oelrichs, and the western border of the Pine Ridge Reservation is about 3,484 feet/day. The Pine Ridge Reservation (Oglala Lakota County) is 46 miles from the Dewy-Burdock site, which means contaminated water from Dewey-Burdock could travel to the Pine Ridge Reservation in 70 days. Edgemont would be affected in weeks, and Hot Springs would be reached in as little as 35 days.

Criteria for exempted aquifers - an aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in §146.3 may be determined under §144.7 of this chapter to be an "exempted aquifer" for Class I-V wells if it meets the criteria in paragraphs (a) through (c) of this section. Class VI wells must meet the criteria under paragraph (d) of this section. In summary, underground injection of ISL mine waste into disposal wells into an exempted aquifer are acceptable if the aquifer isn't currently being used, is likely to never be used, and is currently potable (generally under 3,000 mg/l total dissolve solids). In 2017, in preparation for the public hearing, my colleagues Linsey McLean, Patrisse Vasek, and I (McLean and Vasek, unpublished data) tested 22 private residential and agricultural wells in the Minnelusa Aquifer south of Hot Springs, South Dakota. The highest TDA recorded in these wells was 2,200 mg/l. The Minnelusa Aquifer is potable and currently serves as a source of drinking water and therefore should not be injected with mine waste.

The surface waters of western South Dakota and the Pine Ridge Reservation are contaminated with both uranium and mercury and uranium mining may be the cause

Recently I led an effort by the Lakota People's Law Project to sample and analyze major rivers in western South Dakota for the purpose of identifying ISL mine contaminants (see LaGarry 2020 opinion). This effort was inconclusive. To date, contamination from historical open-pit and modern ISL mining are indistinguishable from each other. Therefore, the Dewey-Burdock Site can be neither blamed nor exonerated. The study clearly showed, however, that in aggregate, both historical open-pit mining and modern ISL mining have poisoned the environment.

This study concluded that: 1) 14 of 16 sites exceed the EPA MCLS for uranium, including all the major rivers and the Min Wiconi Coreline, 2) 11 of 16 sites, including the Mni Wiconi intake from the Missouri River and the Mni Wiconi tap water at Potato Creek, closely approach, equal, or exceed the EPA MCL for mercury, which is extremely toxic, and can lead to renal failure and possibly death or have profound and debilitating effects on the human versus system, 3) several of the waterways examined contain levels of barium, copper, magnesium, manganese, molybdenum, and strontium that approach health advisory levels for small children and require additional study and quantification, 4) several of the major waterways north of the Black Hills have levels of sulfur that pose a danger to livestock and wildlife and require additional study and quantification., and 5) all 16 samples exceed the EPA MCL for Gross Alpha of 15 pCi/L (a measure of the total amount of alpha radiation) with lowest value being from the Grand River (16.9 pCi/L) and the highest being from a tributary of the White River west of Pine Ridge (72.9 pCi/L).

These contaminant levels are already dangerous, and need to be be monitored to make sure they aren't increasing over time. Since both historical open-pit and modern ISL uranium mining are likely contaminating these waterways, I suggest that the open-pit mines be remediated and Dewey-Burdock be closed and the holes plugged before South Dakota's surface waters become even more contaminated.

DISCUSSION AND CONCLUSIONS

It is my expert opinion that in-situ leach (ISL) should never be allowed at the Dewey-Burdock Site because the confining layers at and around the site are unable to contain contaminated mining fluids. Artesian flow, the potential lack of confinement due to secondary porosity and drilling, along with potentially high horizontal flow in the uranium-bearing strata indicate that during the course of its operation the Dewey-Burdock ISL Project will most likely contaminate the region with unconfined lixiviant. This contamination could plausibly pollute groundwaters and surface waters southwards into Nebraska and surface waters within the Cheyenne River drainage eastwards into greater South Dakota. Also, based on my reading of Powertech's application, no review of the geologic literature was conducted. In my view, the use of outdated scientific literature, or in this case, a general lack of review of recent study, should not be seen as an opportunity to operate in a knowledge vacuum. Much of the Great Plains region was studied prior to the 1980's and the general acceptance of Plate Tectonics Theory, and therefore generally misrepresents the geologic setting of the region. This was true of the geologic literature used to justify ISL mining near Crawford, Nebraska, and is also true of the data used to justify proposed mining at Dewey-Burdock. It is incumbent upon potential ISL operators, as it is with any natural resource extractors, to seek out the most recent research and expert opinions on the geological settings in which they propose to operate.

Furthermore, the recent study showing uranium and mercury levels in western South Dakota's rivers and lakes is particularly alarming. The ISL process is intended to prevent widespread contamination of nearby surface and groundwater, and its possible, even likely, that in the case of Dewey-Burdock all of the established precautions have failed. While not as spectacular or abrupt as Fukushima and Chernobyl, the Dewey-Burdock site may nonetheless be similarly contaminating a wide area of western South Dakota. Unfortunately, the potential exists for the situation to become catastrophically worse should, like the crack that opened and took Chadron's water supply, regional tectonics start opening faults and joints that are now closed, releasing even more toxic contaminants into the environment.

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SIGNATURE

The information contained herein is true and correct to the best of my knowledge at the time of this writing on 21 August, 2020.

Hannan E. LaGarry, Ph.D.

526 Chapin Street
Chadron NE 69337